Cobre Limited

Insitu Copper Recovery Ngami Project

Scoping Study

CONFIDENTIAL

Project No. J5945

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J5945 – Cobre ISCR Project – Scoping Study

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Abbreviations

Abbreviation	Definition
AACE	American Association of Cost Engineering
AUD	Australian Dollar
CAPEX	Capital Expenditure
CAGR	Compound Annual Growth Rate
CPD	Continuous Professional Development
DTW	Depth to Water
EK-ISR	Electrokinetic In-Situ Recovery
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EW	Electrowinning
GPS	Global Positioning System
HG	High Grade
IBR	Intermittent Bottle Roll
ISCR	In-Situ Copper Recovery
ISR	In Situ Recovery
JORC	The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves
KAL	Kalahari Sands
KCB	Kalahari Copper Belt
LG	Low Grade
LME	London Metal Exchange
MEL	Mechanical Equipment List
MH	Mineralised Halo
NCP	Ngami Copper Project
NFC	Near Field Communication
NPF	Ngwako Pan Formation

NWTGC	North-west Transmission Grid Connection
OPEX	Operating Expenditure
ORP	Oxidation-Reduction Potential
PD	Process Description
PDC	Process Design Criteria
PFD	Process Flow Diagram
PLS	Pregnant Liquor Solution
RC	Reverse Circulation
RFID	Radio Frequency Identification
RL	Reduced Level
RO	Reverse Osmosis
RQD	Rock Quality Designation
SACU	South African Customs Union
SCDA	Soundless Cracking Demolition Agents
SCM	Supply Chain Management
SX	Solvent Extraction
USD	United States Dollar

1. EXECUTIVE SUMMARY

1.1 Introduction and Background

Cobre Limited is an emerging resources exploration and development company with prospective projects in both Botswana and Western Australia. Cobre's enriched, high grade copper discoveries and high-grade pipeline seeks to underpin copper's future growth in the electric vehicle and renewable energy sectors. Figure 1-1 shows Cobre's Robust Exploration and Development Pipeline for High-Quality Copper Resources.

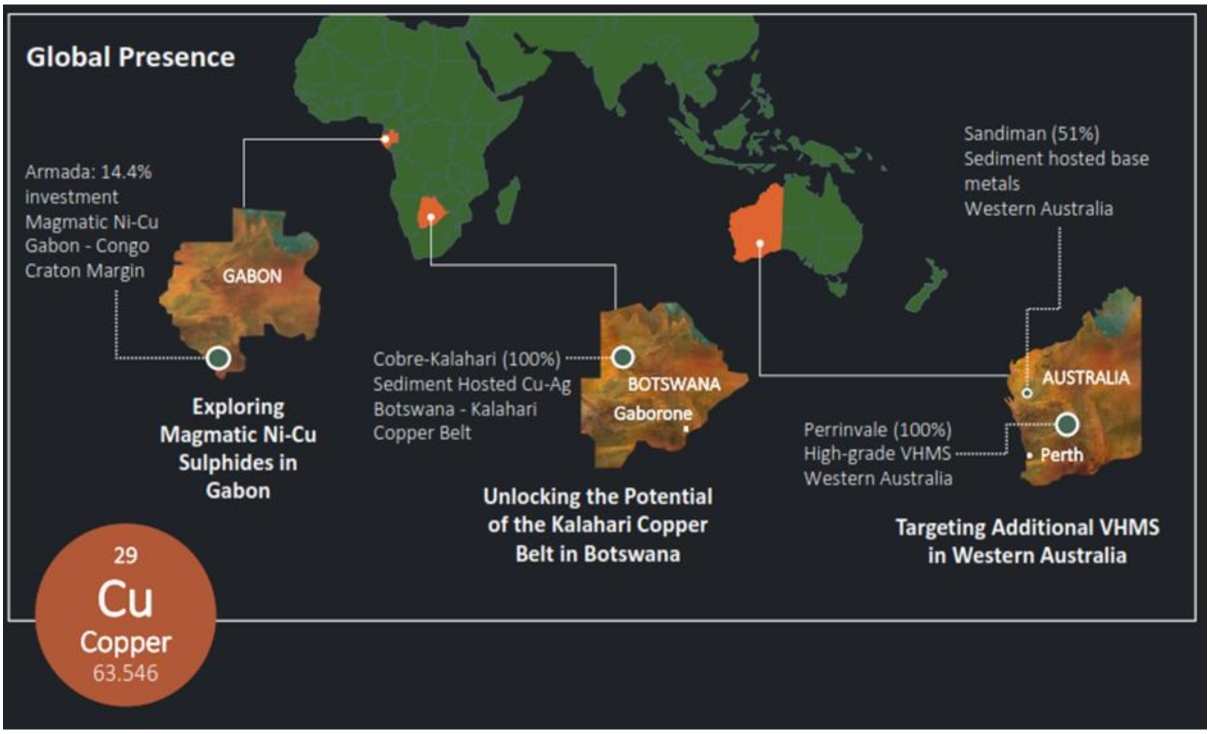

Figure 1-1 Cobre's Global Copper Presence

There is potential for a significant moderate grade copper deposit to host an In-situ Copper Recovery operation at the Ngami Copper Project in Botswana.

Cobre Limited has a focus on the Kalahari Copper Belt (KCB) in Northern Botswana, which is one of the most prospective areas globally for new sedimentary copper discoveries. The company has 100%-ownership of highly prospective copper and silver exploration tenements in the KCB area.

At the Ngami Copper Project hydrogeological drilling commenced during the final quarter of 2023 designed to test the viability of an in-situ copper recovery (ISCR) process to extract copper-silver mineralisation.

The main contributors and consultants engaged for the study are:

- Cobre Limited
- METS Engineering
- AXT Pty Ltd
- ALS Metallurgy Pty Ltd

- Altair Mining Consultancy
- B & S Geological
- WSP

The scope of this study is to provide a process design and financial estimate of an ISCR process for Cobre's Ngami Copper Project (NCP).

1.2 Mineral Resource

The company has 100%-ownership of highly prospective copper and silver exploration tenements in the KCB area. This is the second largest tenement package in the KCB. This tenement consists of four Project Areas:

- Ngami Copper Project (727 km^2),
- Kitlanya East (1,359 km^2),
- Kitlanya West (1,900 km^2) and
- Okavango (1,362 km^2)

This study is based on the Ngami Copper Project (NCP) which covers an area of 727 km^2.

The project area comprises of two significant anticlinal features offering large areas of prospective contact between the Ngwako-Pan (red beds) and D'Kar (marine sedimentary rocks) Formations. Kalahari sands up to 70 metres deep overlie the copper mineralisation which is intersected between 100-300 metres vertically below surface.

Approximately 17,000m of diamond drilling has intersected consistent moderate grade chalcocite dominant mineralisation along extensive strike lengths including structurally controlled high-grade intersections:

- 9.3 m @ 3.4% Cu and 30 g/t Ag(downhole)
- 10.7 m @ 1.3% Cu and 18 g/t Ag (downhole)

Modelling based on the diamond drill results has defined an exploration target with significant scale as shown in Table 1-1 and Table 1-2.

Table 1-1 Mineral Resource Tabulation by Classification category (Cu%)

Class	Tonnes	SG	Cu pct	Metal (tonnes)	Lower Tonnes	Upper Tonnes	Lower Cu%	Upper Cu%
3	2 803 150	2.77	0.59	16 438	n/a	n/a	n/a	n/a
4	20 557 976	2.77	0.49	99 817	15 517 805	25 598 146	0.44	0.53
5	66 073 430	2.77	0.40	262 430	49 537 268	82 609 592	0.36	0.43
6	45 253 719	2.77	0.40	182 879	3 587 055	54 640 384	0.37	0.44

Table 1-2 Mineral Resource Tabulation by Class (Ag ppm)

Class	Tonnes	SG	Ag ppm	Metal (Oz)	Lower Tonnes	Upper Tonnes
3	2 803 150	2.77	11.73	1 056 874	n/a	n/a
4	20 557 976	2.77	7.28	4 813 524	15 517 805	
5	66073430	2.77	7.20	15 293 078	49 537 268	
6	45253719	2.77	7.20	10 474 994	3 587 055	

Figure 1-2 illustrates the company's four project areas together with existing mines and significant deposits.

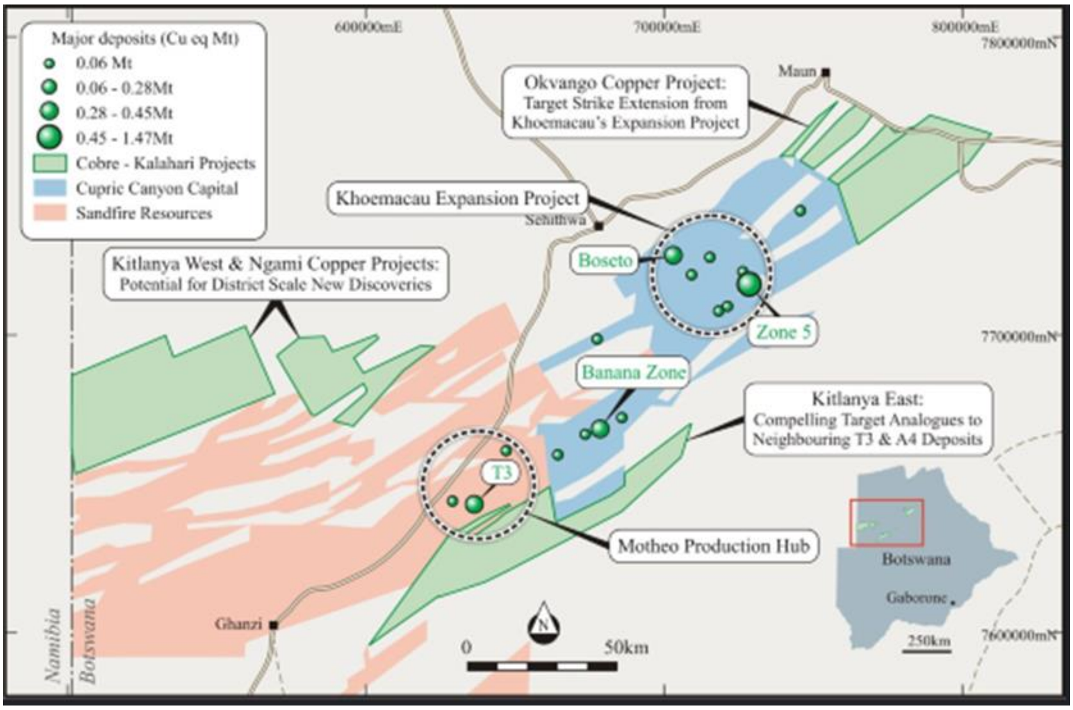

Figure 1-2 Kalahari Copper Belt Tenure Position and Significant deposits

1.3 Geology

The Ngami Copper Project (NCP) is a sedimentary hosted, structurally controlled system with a copper silver mineralisation situated approximately 70 m below Kalahari sands within the Kalahari Copper Belt (KCB), Botswana.

The project area encompasses two significant anticlinal features, offering more than 100 km of prospective contact between the Ngwako-Pan (red beds) and D'Kar Formation (marine sedimentary rocks), known for traditional limb-based mineralisation. An illustration of the mineralisation associated with structures at the contact of the D'Kar Formation (DKF) and the Ngwako Pan Formation (NPF) is shown in Figure 1-3.

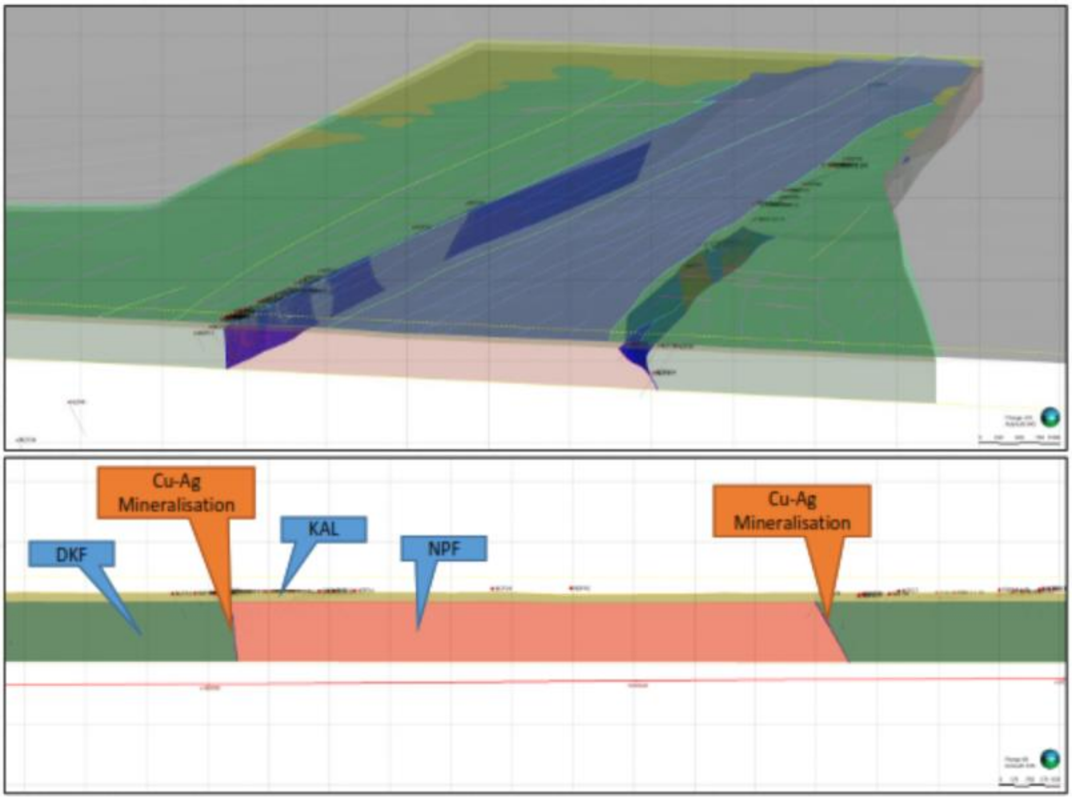

Figure 1-3 Section looking NE – Antiform Subcrops ~70 m Below the Kalahari Sands. Mineralisation Associated with Structures at the Contact of DKF and NPF

- KAL - Unconsolidated and Semi-consolidated Kalahari Sands.
- DKF (D'Kar Formation) - sandstones, siltstones, shales, conglomerates. Primary host for mineralisation.
- NPF (Ngwako Pan Formation) red beds – sandstones, siltstones, shales and mudstones.
- Cu-Ag Mineralisation - mineralisation at the contact between the DKF and NPF.

Mineralised domains are based on drilling assay information and were created using Leapfrog Geo^{TM} software. Two cut-offs were chosen for the project's categorisation:

- Higher grade (Cu % > 0.5) – (HG)
- Lower grade Mineralised Halo (Cu % 0.2 – 0.5) – (MH)

Four discrete mineralised halo domains were identified in the northern limb and three in the southern limb. Higher grade domains were created within each mineralised halo at a 0.5 Cu% cut-off.

The drill program's primary focus was to target the high fracture zones associated with the lower mineralised cycle of the D'Kar Formation. Drilling focused on the southern anticlinal structures (extends ~40 km) with mineralisation on both southern and northern limbs displaying fine grained chalcocite within the cleavages, along parting planes and fractures.

The drilling covers distances along strike in the order of 20 km on the northern limb and 17 km on the southern limb and as shown in Figure 1-4, with higher density drilling at the Comet deposit (northern limb) and the Interstellar deposit (southern limb).

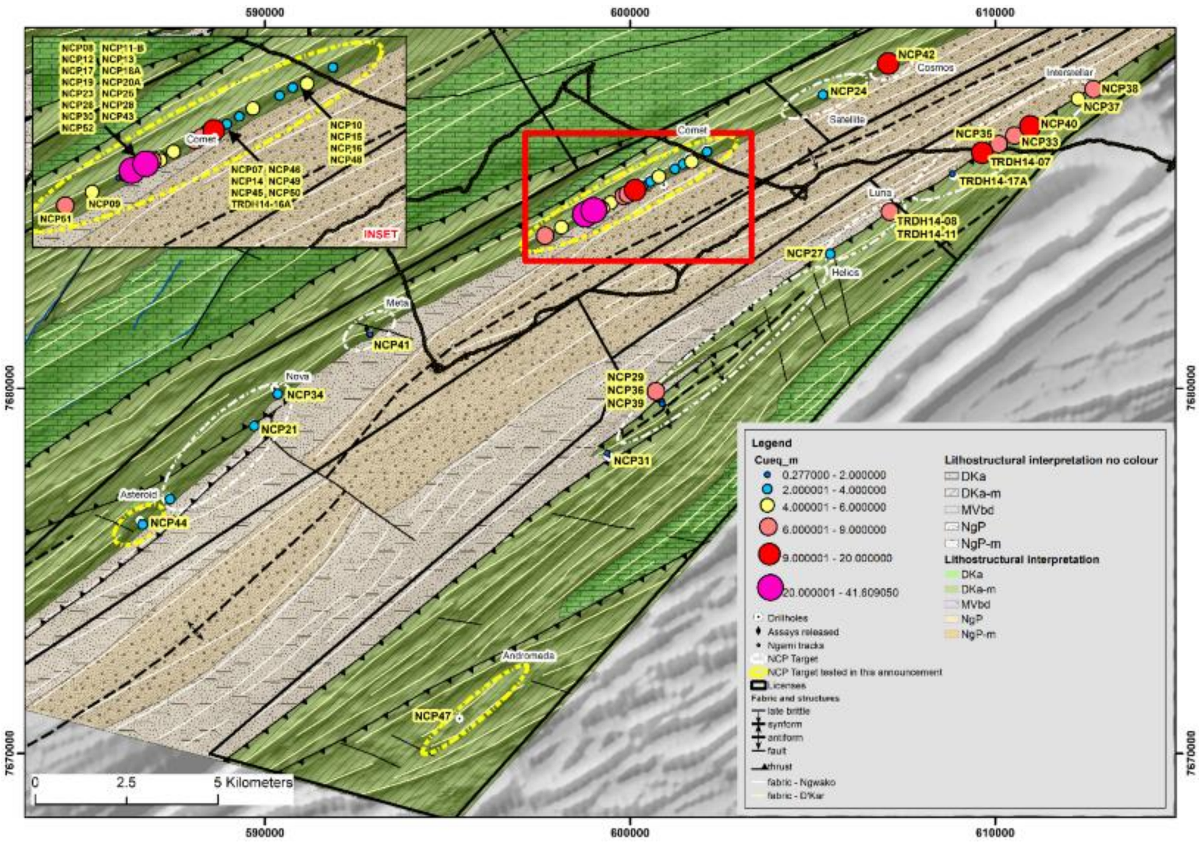

Figure 1-4 Drill Hole Locations

In the extensive drilling programme at NCP, the drilling has intersected sedimentary-hosted, strata bound and structurally controlled, copper-silver (Cu-Ag) mineralisation on the limbs of anticlinal structures. This mineralisation is associated with the redox contact between oxidised Ngwako Pan Formation red beds and overlying reduced marine sedimentary rocks of the D'Kar Formation. The assay of the drill core revealed significant and consistent intersections of moderate-grade copper-silver (Cu-Ag) mineralisation along extensive strike lengths, suggesting the presence of potentially large, moderate-grade copper deposits that stretch over tens of kilometres on both the northern and southern limbs of the targeted anticline. Most exploration holes on the Comet deposit exhibit low Rock Quality Designation (RQD) which is associated with fractured zones with multiple joint sets. Detailed fracture logging has been undertaken on drill holes across the Comet target in NCP.

1.4 Hydrogeology

Site characterisation efforts have focused on existing geological data and field program results, including the installation of pumping/injection wells and monitoring wells. The field programme included a series of pumping and injection trials undertaken to assess key hydrogeological parameters, such as hydraulic conductivity and storage capacity, as well as assessing the aquifers' ability to undergo injection and pumping. For economic recovery of copper using in-situ leaching certain hydrogeological conditions must be present within an ore body such as;

- A saturated body.
- Sufficient porosity and permeability (hydraulic conductivity) within the fractured bedrock.
- Hydraulic connection between the injection and recovery wells so leach solution can circulate through the mineralised bedrock; and
- Lixiviant /mineral contact and adequate lixiviant retention time.
- Moreover, deep groundwater levels are preferred to minimise the risk of injectant or groundwater returning to the surface or migrating to areas that are not the target for leaching.

Cobre commissioned WSP to assess the potential hydrogeological conditions of the project area in NCP. Findings from the assessment showed that key hydrogeological features of the NCP listed below are beneficial for insitu copper recovery (ISCR):

- Unconsolidated and Semi-consolidated Kalahari Sands
- Depth of Groundwater
- Increasing Water Table
- Folded Structures
- Ngwako-Pan and D'Kar Formations Contact
- Lateral Continuity
- Anisotropy

1.5 Metallurgical Testwork

1.5.1 IMO Testwork

Initial metallurgical testwork was completed in November 2023 by Independent Metallurgical Operations Pty Ltd (IMO). The aim of the testwork was to determine the leaching potential of the ore body. A serious of drill samples were taken, with the samples used in this testwork being course rejects remaining from previous assay tests. The materials had a crush size P_{90}, of 2 mm.

Two composite samples were generated for the testwork. The samples were made to produce a high grade (HG) and low grade (LG) composite. The HG composite had a head grade of approximately 2.72% Cu, while the LG composite had a head grade of approximately 0.56% Cu.

Acid leach testing was conducted on both composites using an intermittent bottle roll (IBR) leach test to assess the potential copper recoveries via sulphuric acid leaching. A series of tests were conducted with relevant changes to the test conditions. These series of test conditions can be seen in Table 1-3.

Table 1-3 Metallurgical Testwork Operating Changes

The bottle roll results are presented in Figure 1-5 and Figure 1-6.

High Grade Composite		Low Grade Composite	
Sample	**Changes**	**Sample**	**Changes**
R1-1	Default Conditions	R1-2	Default Conditions
R2-1	Increased E_H	R2-6	Increased E_H
R2-2	20 g/L Chloride	R2-7	20 g/L Chloride
R2-3	100 g/L Chloride	R2-8	100 g/L Chloride
R2-4	$KMnO_4$ used as Oxidising Reagent	R2-9	$KmnO_4$ used as Oxidising Reagent
R2-5	70ºC Operating Temperature	R2-10	70ºC Operating Temperature

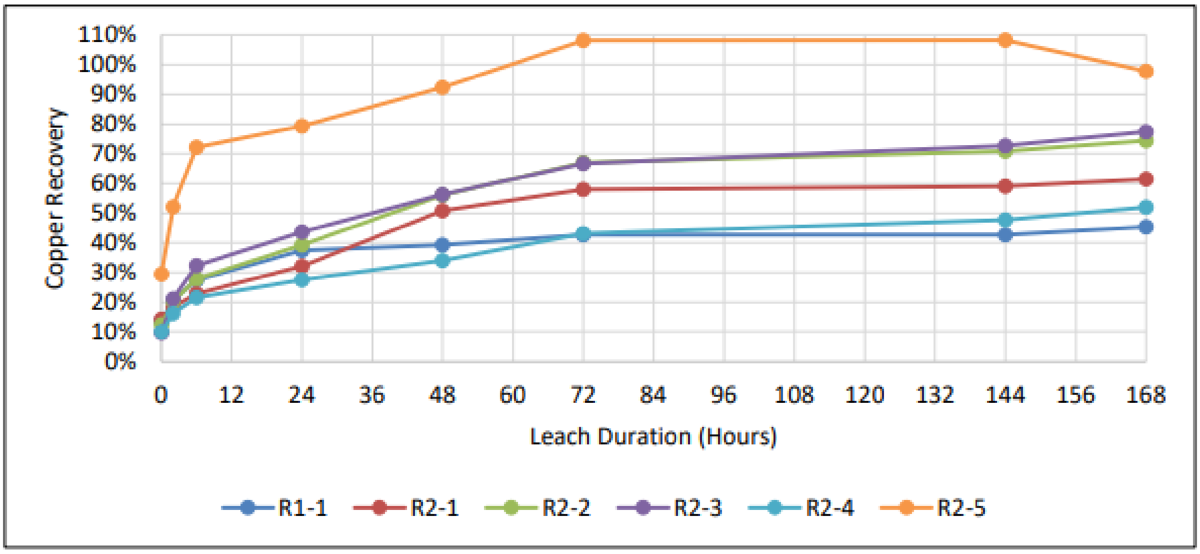

Figure 1-5 IMO High Grade Composite Leach Kinetics

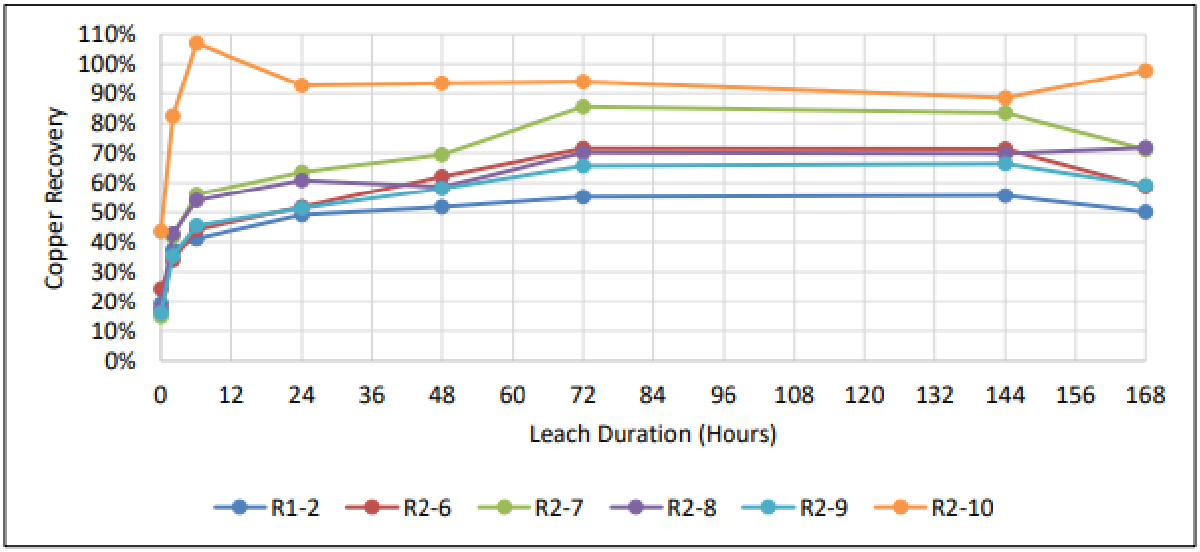

Figure 1-6 IMO Low Grade Composite Leach Kinetics

Although not indicated in the recovery graphs, it is important to note that the inclusion of chloride ions in the system induced silver leaching as well. At 100 g/L the silver recoveries were 43.5% (HG) and 80.5% (LG). Depending on mineralogy it may be possible to leach the silver from the orebody.

Despite indicative recoveries during the IMO testwork reaching a maximum of 97.8% it is likely that true values for copper recovery in practice are lower. ISCR typically has lower recovery values than traditional agitated or heap leaching, especially when compared to the laboratory data collected through IBR. This data, however, is still important. It assesses the leachability of the ore and provides preliminary baseline information and trends that assists in making informed decisions in planning future testwork and process development that will aid the development of the ISCR project.

1.5.2 METS Testwork

METS bottle roll leach tests conducted as a part of the long-term In-situ Copper Recovery (ISCR) study with the objective of these tests to validate historical leach testwork and optimise the leaching conditions for the long term ISCR tests.

A total of 30 samples from different intervals were collected from drill holes. Of these, five samples were selected for head assay, mineralogical analysis and for bottle roll leach tests. The remaining samples were reserved for the ISCR tests.

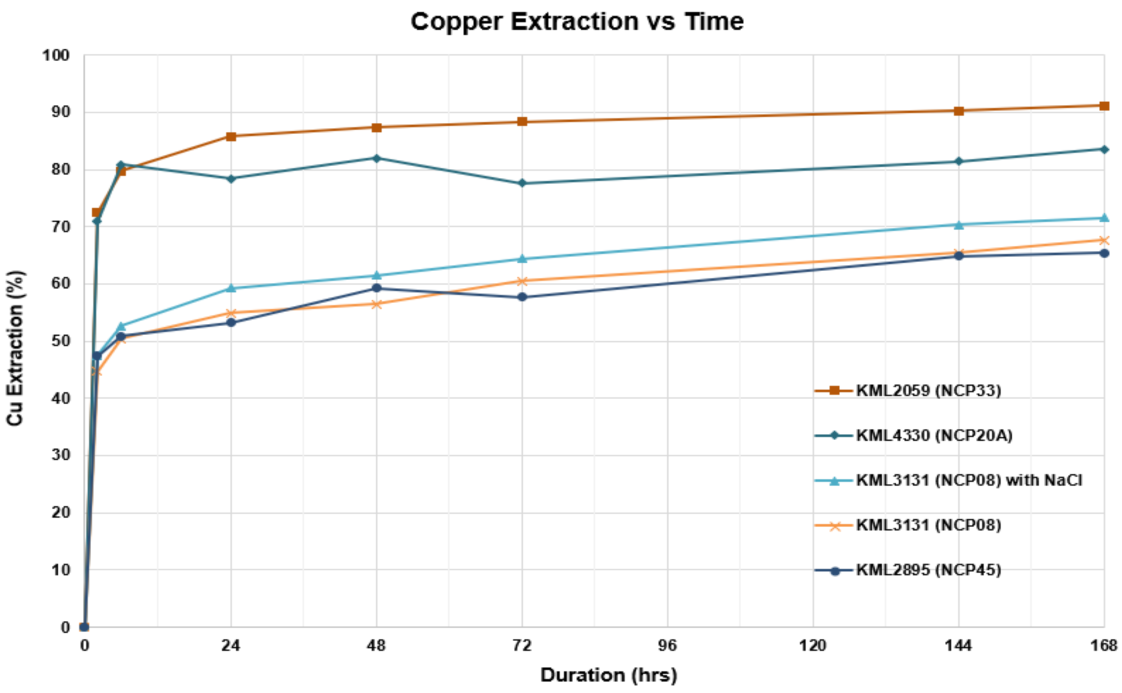

Figure 1-7 Copper Extraction vs Time

The bottle roll leach tests conducted as part of the In-Situ Copper Recovery (ISCR) study provided critical insights into the leaching behaviour of five samples from different drill holes. KML2059 achieved the highest copper extraction (90.7%) with minimal reagent consumption, indicating its leachability and potential for the ISCR process. KML4330 also performed well, achieving 85.19% copper extraction with low reagent usage.

Sample KML3131 required chloride addition to enhance silver extraction and achieve moderate copper recovery (71.7%). The non-chloride version of KML3131 performed less effectively, showing slower copper kinetics and negligible silver recovery.

These results indicate that reagent consumption can be optimised depending on the ore's mineralogy, particularly when considering the use of NaCl to boost silver recovery. Samples like KML4330 and KML2059 suggest that efficient copper extraction can be achieved without additional oxidising agents, making them ideal candidates for future ISCR optimisation.

The next step in this study should focus on long-term leaching tests to confirm the initial findings from the bottle roll tests. Specifically:

- Leach Box tests will simulate in-situ leaching to assess fluid flow, metal recovery, and reagent consumption, providing long-term leaching kinetics and helping to optimise conditions for future leach box tests on drill hole samples, wellfield samples, and pilot scale operations before full scale operations.
- KML2059 and KML4330 showed high copper recoveries with low reagent consumption. These along with other samples will be undergo further specialised testing to test amenability to ISCR.

- For samples like KML2895, where recovery was lower, further investigation into alternative oxidising agents or extended leach times may improve performance.

1.6 In Situ Recovery

In-situ recovery (ISR) also referred to as solution mining, is generally a process used to recover minerals in situ through boreholes drilled into an ore deposit. Injection wells and recovery wells will be drilled within copper mineral ore deposits at NCP.

An acidic leaching agent added from the injection wells will travel through naturally occurring fractures within the orebody extracting the copper. Copper rich solution will be pumped to the surface through recovery wells.

The NCP area has characteristics that make in-situ recovery process feasible for copper extraction. These are:

- It has mineralisation suitable for acid/ferric leaching which has been metallurgically proven. The orebody contains fine grained chalcocite which is ideal for hydrometallurgical processes.
- The ore body contains fractures and cleavages which enhance fluid movement for leaching. The interconnected fracture orientation facilitates fluid flow parallel to and along the mineralised contact zone.
- Most of the ore body is below the water table. The water table is 130 m -140 m below the surface.
- It has competent footwall and hanging-wall rocks which provide lateral seals.

1.6.1 Wellfield Arrangement

A line drive pattern will be utilised for the NCP ore deposit. A line drive arrangement involves arranging wells in parallel lines with alternating rows of injection and recovery wells. Due to the narrow nature of the ore body a single line will be utilised, and alternating injection and production wells will be used along strike. This configuration effectively enhances leaching efficiency and metal recovery by ensuring uniform distribution of the leaching solution across the ore body.

Injection testing performed in May 2024 performed by WSP evaluated a range of injection rates for 24 hours. By monitoring the groundwater level in monitoring wells at different distances from the injection wells a constant injection rate of 3 L/s for 24 hours was observed. This is positive for the implementation of an ISR in this ore body.

1.6.2 Wellfield Operation

The solution is injected directly into the ore deposit via injection wells during the first injection cycle. A surface-mounted positive displacement pump will pump the leaching solution down the injection wells.

In-situ leaching for copper extraction involves the preparation of a leaching solution primarily consisting of sulphuric acid. Sulphuric acid serves as the main agent to solubilise copper minerals from the ore deposit. The solution is injected directly into the ore deposit via injection wells mention above.

As the leaching solution infiltrates the ore deposit, it interacts with copper-bearing minerals, chalcocite (Cu_2S), chemical reactions dissolve the copper into solution. The primary reaction of importance is the dissolution of the copper sulphide mineral by the acidic solution, forming soluble copper sulphate complexes.

$$Cu_2S_{(s)} + O_{2(g)} + 2H_2SO_{4(aq)} \rightarrow 2CuSO_{4(aq)} + 2H_2O_{(l)} + S_{(l)}$$

During the process, impurities in the ore, such as zinc and nickel, must be controlled to prevent contaminant build up in the raffinate. Once the copper is dissolved into the solution, the pregnant leach solution (PLS) containing dissolved copper migrates towards strategically placed recovery wells. Submersible pumps are employed to transfer the PLS from the recovery wells to storage tanks for further processing. This injection and extraction process is repeated as necessary across the orebody to ensure comprehensive coverage for copper extraction.

1.6.3 Wellfield Rinsing and Closure

The rinsing process after copper extraction involves three stages:

- Early Rinse
- Rest Period
- Late Rinse

Once the closure criteria for the wellfield are met, the injection and recovery wells are abandoned through grout injection from the bottom. This systematic process ensures comprehensive recovery of process solutions, restoration of water quality, and facilitates the decommissioning of the wellfield. Commonly referred to as well remediation.

1.6.4 Wellfield Staging and Development

The wellfield will be staged developed. This will allow for the project to commence with a small initial capital and a small resource under leach. As the resource grows down strike the strategic placement of subsequent wellfields can be brought online to maintain copper production. The wellfield during Stage 1 will be sized to support a Starter Plant with a production capacity of 1.9 ktpa copper for the first 3 years of production. In Stage 2 the wellfield size will be increased to support full production 40 ktpa Cu production. Each wellfield stage block has the following design for duplication along strike as summarised in Table 1-4.

Table 1-4 Well Field Design Criteria

Description	Stage 1 – Starter Plant	Stage 2 – Full Production	Units
Wellfield Length along strike	500	10500	m
Well Spacing	100	100	m
Number of Wells	5	105	-

Description	Stage 1 – Starter Plant	Stage 2 – Full Production	Units
Production/ Injection Wells	Dual purpose	Dual purpose	
Well Arrangement	Line Drive	Line Drive	-
Drill Depth	260	260	m
Flowrate per well	3	3	L/s
Maximum Wellfield PLS Flowrate	54	1135	m^3/h

1.7 Processing

Ore from the proposed Ngami Copper Project (NCP) will undergo in-situ recovery. The loaded solution from the wellfield after recovery is transferred to the processing plant for downstream processing to produce LME copper cathodes, silver metal and copper sulphate. The process plant will consist of the following areas:

- Area 100 ISCR Wellfields where copper and silver extraction occurs producing a pregnant leached solution.
- Area 200 Tank, Pond and Reagents farm. All the solution and reagents will be stored in this area.
- Area 300 Silver Precipitation and Production: Silver is recovered from the pregnant leached solution and silver ingots are produced for sale.
- Area 400 Solvent Extraction: Copper is concentrated from pregnant leached solution for electrowinning.
- Area 500 Electrowinning and Copper Sulphate Crystallisation: where LME copper is plated, and copper sulphate is crystalised for sale.
- Area 600 Site Services: Area which includes water, air, fuel and power services.

The block flow diagram of the overall process is presented in Figure 1-8.

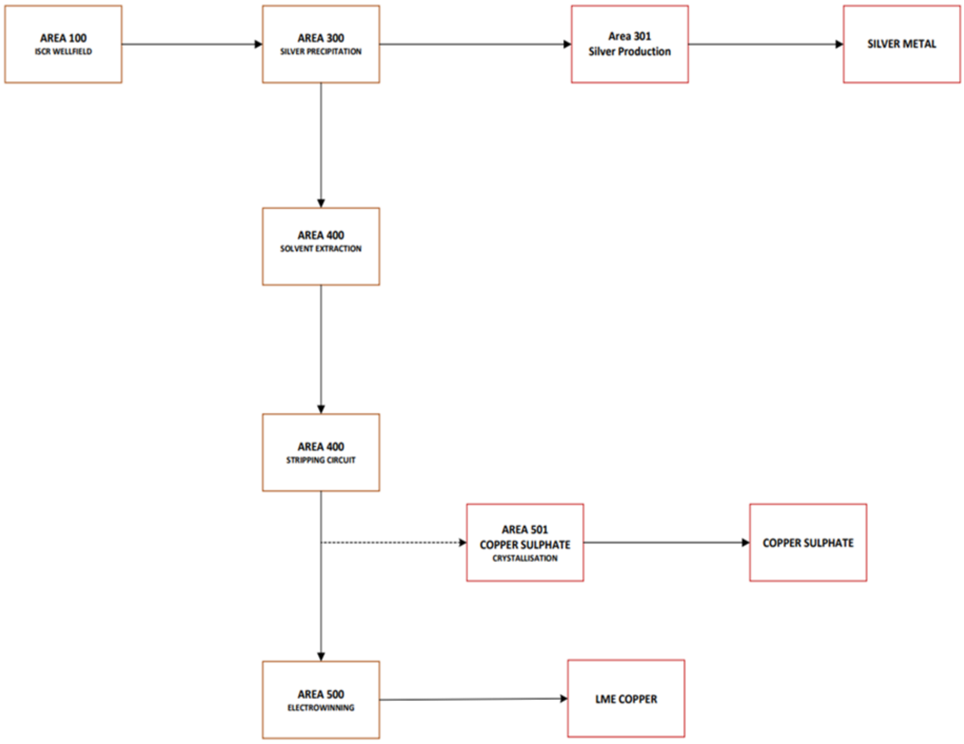

Figure 1-8 Block Flow Diagram

1.8 Process Design Criteria

The key process design criteria are summarized in Table 9-2. Stage 1 will be constructed with an initial plant capacity of 1.9 ktpa Cu production. This plant will operate with supporting wellfields for an initial 3 year period before production is ramped up with the commissioning of a full scale plant in year 4 to produce a target of 40 ktpa.

Table 1-5 Process Design Criteria

Assumptions	Unit	Stage 1 – Starter Plant	Stage 2 – Full Production
Resource Under Leach	Mt	1.315	27.66
Silver Feed Grade	g/t	7	7
Copper Feed Grade	%	0.40	0.4
Copper Production	ktpa	1.9	40
Silver Production	t/a	1.88	39.5
Copper Recovery	% Cu	36	36
Silver Recovery	% Ag	20.4	20.4

1.9 Infrastructure

The Cobre Copper Project is situated within the Kalahari Copper Belt, specifically between the town limits of Ghanzi and Maun in Botswana. The Kalahari Copper Belt (KCB) extends 1,000 kilometers from northeast Botswana into Namibia and has emerged as a significant area for the discovery of sediment-hosted copper deposits.

In 2023, the KCB became a copper-producing district, hosting several mining operations, including Sandfire's Motheo Copper Mine and MMG Khoemacau Copper Project. Consequently, there are mining services and local infrastructure supporting operations in and around the area.

An extensive range of infrastructure is available in proximity and can be leveraged for the Cobre project. The property is well situated amidst other mining projects and nearby towns, implying that essential services such as water, power, and communications are likely to be readily accessible.

Additionally, the region has well-established road networks and ongoing power-related initiatives, such as the North-west Transmission Grid Connection (NWTGC), which aims to deliver electricity to the newly established KCB mines.

1.9.1 Site Access

The NCP site is accessible via the A3 highway. However, due to its location approximately 50 km away from the highway, an additional access road will be necessary for direct entry to the site.

1.9.2 Railway

The railway network in Botswana primarily extends along the eastern and southern parts of the country, with no rail lines passing through the northwestern region as such there is no railway access to NCP.

1.9.3 Sea Port

As Botswana is a landlocked country, road access to foreign seaports necessitates crossing national borders. An early preferred selection of seaport is Walvis Bay in Namibia, which is a major port with well-established infrastructure and the shortest distance to the project site.

1.9.4 Airports

Two airports are identified in the region:

- Maun international airport
- Ghanzi Airport

Both airports are connected to the A3 highway and have direct road transport to the Cobre's Ngami project site.

1.9.5 Power

Botswana primarily relies on coal for electricity generation with approximately 79% of the installed capacity coming from coal-fired power stations, due to its abundant coal reserves, estimated to be around 192 billion tonnes. The next significant source is electricity imports, accounting for 19.9% of the total with diesel and solar power contributing minor shares of 0.4% and 0.1% respectively.

An option to fulfill the power requirement for the project will be through a grid connection with Botswana Power Corporation (BPC). The ongoing Northwest Transmission Grid Connection (NWTGC) project, initiated in 2018, aims to extend the high-voltage electricity network to the Northwest, Chobe, and Ghanzi Districts. Logistics

Given the plant's location away from the highway, it will be necessary to construct a 50-kilometer-long 132 kV overhead transmission line. Additionally, a new switching station will be established at the junction between the access road and the highway to facilitate the grid connection.

Due to the capital cost of connecting to the grid an alternative is onsite power generation. The first alternative involves utilising diesel-powered engine generators (Gensets). These generators offer a cost-effective and adaptable solution. On-site, diesel fuel will be necessary for operating all plant vehicles, and emergency generators.

Cobre will consider integrating a renewable energy source into its power supply generation. The impact on power costs, minimising environmental impact, lowering greenhouse gas emissions, and enhancing the overall outlook for the Cobre Project are key drivers for progressing the adoption of renewable power generation onsite.

Among the available renewable energy options, solar energy stands out as the most viable choice.

1.9.6 Water

The raw water requirements for the processing plant will be met by sourcing from several nearby boreholes. However, hydrogeology studies must be conducted to determine the locations of these boreholes and assess their water quality and content. Subsequently, the water from the various boreholes will be pumped to a strategically located reservoir (or tanks) From there, it will be transferred via a buried pipeline to the processing plant site.

An addition consideration for borehole placement to source water is in future ISCR wellfields. The aquifer could be drained ahead of ISCR wellfield development allowing for water to be sourced closer to site. Additional benefits of this approach include draining the wellfield prior to injecting lixiviant and reducing the dilution of the leach solution. Reduced pumping cost from distant borefield aquifers and reduced drilling cost for multipurpose boreholes.

The only body of water is Lake Ngami which is a seasonal water source and is a considerable distance from site.

Ground water can be used to supply most of the water to the mine site. Currently in Botswana there is a myriad of sites that supply their own water to great success, with mines in Botswana making up 15% of the country's total water use. Around 85% of all mining water used is supplied by the mine sites themselves.

1.10 Logistics

The main product onsite will be copper and the copper produced on site is LME grade copper cathode and will be bundled into lots. Additional byproducts produced alongside the copper cathode will be silver ingots and copper sulphate. For product exports via sea freight the nearest identified port of Walvis Bay in Namibia.

Currently, the most feasible method to export products out of Botswana is to transport the copper via truck to port for shipping. From the mine site, approximately 1.9 ktpa and 40 ktpa of copper will be transported 1,100 km to the Walvis Bay Port during Stage 1 and Stage 2 respectively.

Road transport of imported goods from the port to is also likely the most effective method to acquire reagents and other consumables.

Most equipment used for the project will need to b.e acquired from out of country. This includes processing equipment such as solvent extraction mixer settler units and electrowinning cells. For infrastructure and buildings however, suitable local companies can be used to develop the project. This will allow the project to assist the local economy and communities. Most of the largest construction companies within Botswana are in the southeast of the country, in Gaborone, such as Concor, UNIK Construction and SMEC Botswana. The Cobre Copper project is located approximately 800km away from Gaborone, during construction of the project, the travel or remote work costs will have to be included and discussed with the chosen construction company to ensure an accurate pricing for the development of project infrastructure.

The commissioning of the site will be planned closer to the detailed design of the process, when exact equipment specifications are available.

1.11 Capital Cost

METS developed a cost estimate for the proposed NCP project. This provides substantiated costs for the project infrastructure and to aid in the economic assessment. The overall CAPEX estimation was consolidated by METS utilising METS estimating procedures and systems. The capital cost is estimated at scoping study level for this study work with an order of accuracy +50% or -30%, within the expected accuracy of a AACE Class 4 Estimate.

The capital cost for the project is across 2 stages of development. First stage is for the initial production of 4 Mlb/a before the operation is ramped up to full scale production in year 4 to 88 Mlb/a. The lower capital cost for stage 1 provides a lower capital and risk establishment for the project. The Capital Cost Summary is shown in Table 1-6.

Table 1-6 Capital Cost Summary

Description	Stage 1 Starter Plant Capital Cost Estimate	Stage 2 Full Production Plant Capital Cost Estimate
Total Direct Costs AUD	$34.3M	$244.8M
Total Indirect Costs AUD	$22.0M	$157.0M
Total Capital Cost AUD	$56.4M	$401.8M
Total Capital Cost USD	$36.7M	$261.3M

1.12 Operating Cost

Operating costs were determined for In-situ Copper Recovery (ISCR) at a scoping level. The overall operating cost estimate was consolidated by METS using METS estimating procedures and systems. These are based on an in-house database built from previous experience, online research and vendor quotes. All monetary figures were reported in Australian Dollars with United States Dollars conversions reported for key values. This OPEX is estimated at scoping study level for this study work with an accuracy at ± 30%.

A summary of the overall operating cost estimates is provided in the Table 1-7.

Table 1-7 Operating Cost Summary

Description	Stage 1 Starter Plant Capital Cost Estimate	Stage 2 Full Production Plant Capital Cost Estimate
Total Operating Cost AUD	$18.7M	$110.8M
Total Operating Cost USD	$12.1M	$72.0M
AUD/t ROM	$9,754.32	$2,769.33
AUD/lb of copper	$4.42	$1.26
USD/lb of copper	$2.88	$0.82

1.13 Marketing

The objective of this market section is to:

- Identify the target markets and customers for the products
- Determine the likely market price for the products
- Consider target sales in the context of global market supply and demand

- Identify opportunities and challenges associated with marketing, sales and production.

It is anticipated that the project will produce three (3) products, these include:

- Copper Metal LME Grade
- Copper Sulphate Pentahydrate
- Silver Metal

The copper recovered from in-situ recovery can either be used to form copper metal of LME grade from electrowinning or copper sulphate pentahydrate from crystallisation. The distribution ratio will be determined and adjusted based on the market demand of each to achieve maximum revenue. Additionally, silver metal is foreseen as a potential by product based on current test work results that indicate potential for co-leaching of the silver with the copper.

For evaluating the Cobre ISCR project, METS has relied on the following long-term prices for the products:

Table 1-8 Cobre Product Prices

Product	AUD	USD
LME Copper	6.62 / lb	4.30 / lb
Copper Sulphate	3,465 t	2250 t
Silver	46.2 / oz	30 / oz

1.14 Economic Analysis

A comprehensive financial model and associated economic analysis was prepared for the Ngami In-situ Copper Recovery project. The financial model is conceptual and indicative in nature, which aims to provide economic assessment results based on estimates of the capital expenditures (CAPEX) and annual operating expenditures (OPEX) of the proposed plants. Necessary assumptions have been made and integrated into the overall project financial model.

1.15 Financial Summary

The financial metrics from the base model considered Net Present Values (NPV) calculated at range of discount rates (5 – 10%). Result presented in Table 1-9. As the discount rate increases the NPV amount gradually decreases. The IRR and payback period remains the same regardless of a change in the discount rate. For the project’s sensitivity analysis, the discount rate of 10% has been applied to accommodate risk and no value was assigned to copper sulphate product.

Table 1-9 Base Case Model Financial Summary

Discount Rate (%)	10%	8.75%	7.50%	6.25%	5.00%
NPV (AUD $M)	$870	$935	$1,005	$1,082	$1,165
NPV (USD $M)	$565	$607	$653	$703	$757
Internal Rate of Return (%)	75.7%	75.7%	75.7%	75.7%	75.7%
Payback Period – Stage 1 (Years)	0.56	0.56	0.56	0.56	0.56
Payback Period – Stage 2 (Years)	1.27	1.27	1.27	1.27	1.27

1.16 Sensitivity Summary

Several sensitivity analyses were performed on the financial model base model at a discount rate of 10% looking at copper recovery, net present value and internal rate of return.

- When copper recovery is less than 30%, NPV is projected to be negative.
- NPV is most sensitive to copper price and feed grade followed by OPEX.
- IRR is most sensitive to sensitive to copper price and feed grade followed by CAPEX

1.16.1 Copper Recovery

A sensitivity analysis of the copper recovery was undertaken on the base case model, which aims to evaluate the impact of the recovery on the net present value and internal rate of return. A focus on recovery between 30 to 60% is presented here in Table 1-10. NPV ranges from USD410M to $1,211M when recovery increases from 30% to 60%. For the recovery range from 30 to 60% copper recovery IRR range from 63.10 to 132.56%. Payback period ranges from 0.23 years to 0.85 years for Stage 1 Starter Plant and 0.64 to 1.69 years for Stage 2 Full Production Plant.

Table 1-10 Copper Recovery NPV and IRR Sensitivities

Copper Recovery	30%	40%	50%	60%
NPV $M AUD (@10% discount rate)	$631	$1,042	$1,454	$1,865

Copper Recovery	30%	40%	50%	60%
NPV $M USD (@10% discount rate)	$410	$677	$944	$1211
IRR	63.10%	88.79%	111.54%	132.56%
Payback Period – Stage 1	0.85	0.45	0.30	0.23
Payback Period – Stage 2	1.69	1.09	0.81	0.64

1.17 Risk Assessment and Opportunities

METS has performed a high-level risk assessment in conjunction with project stakeholders to highlight the major risks to the Cobre Copper project that could impact the development and operation of the project.

The project risk and opportunities register were developed, and mitigation have started to be implemented. The project risk assessment undertaken for the scoping study identified a total of 123 risks.

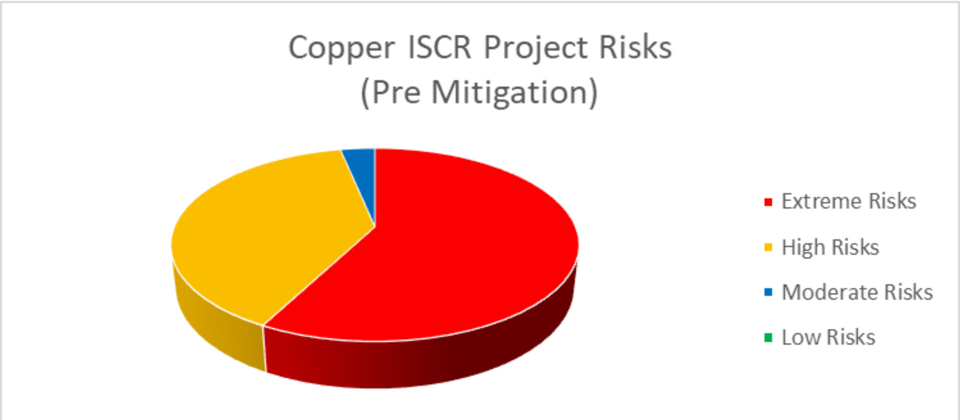

Figure 1-9 Copper ISCR Project Risks (Pre-Mitigation)

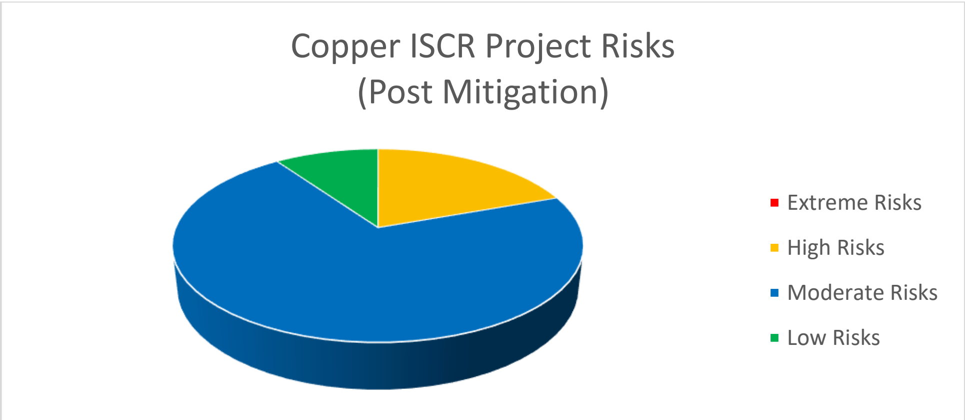

Figure 1-10 Copper ISCR Project Risks (Post-Mitigation)

Figure 1-9 and Figure 1-10 shows the breakdown of the risk pre and post mitigations respectively. Post mitigation the project has no extreme risks and 24 high risks.

1.18 Environmental and Permitting

The project is currently compliant with the Department of Environmental Affairs under an Environmental Management Plan (EMP) that was initially designed for exploration activities. As the project transitions towards operational phases, it will be essential to assess the adequacy of the existing EMP and identify any additional environmental safeguards or permits that may be required. The scoping study tries to outline the current environmental status and describes, in general terms, the necessary steps for ensuring continued compliance and environmental responsibility as the project develops.

It is essential for Cobre to consult and engage with government organisations and decision-making authorities across numerous government agencies during the development of the project.

1.19 Human Resources

The Botswana Labour Market Analysis reveals a landscape characterised by quite a few significant challenges and as well as opportunities. The country's labour market faces considerable strain with a national unemployment rate of approximately 24.5% in 2023. While Botswana boasts a relatively high literacy rate and secondary school enrolment, there is a disconnect between educational attainment and employment, especially in aligning technical and vocational training with market demands. The labour force participation rate stands at about 65%, with women underrepresented in the formal workforce. This highlights the need for more inclusive employment practices. Key industries driving the economy include mining, particularly diamond mining, which is central to Gross Domestic product (GDP) and employment, alongside growing sectors such as services and agriculture.

Regionally, the labour market conditions around the Cobre NCP ISCR project differ from the national outlook. The local economy is predominantly rural, with subsistence farming and informal employment playing significant roles. However, the mining sector's presence provides opportunities for employment, albeit mostly in low-paying, low-skilled jobs. There is a notable shortage of highly skilled labour in the region, particularly in technical roles crucial for mining operations. Addressing these skill gaps is vital for the project's success and presents an opportunity for investment in local training and development programs.

The workforce required for the project will consist of 88 in Stage 1 and 114 in Stage 2 direct employees across various roles for ISCR operation, with a mix of local and expatriate talent, necessitating a strategic approach to recruitment and skill development to ensure the project’s long-term viability and community benefit.

1.20 Project Execution

This chapter outlines the recommended strategic steps to ensure a systematic and efficient transition for the Cobre NCP ISCR project, highlighting the pivotal phases, milestones, and critical actions that guide the project from the initial exploration of the deposit through to the commencement of mining activities.

Project execution starts from the geological exploration, hydro-geological study and metallurgical testwork, which form the backbone of the project's viability. These initial steps involve extensive mapping, sampling, and advanced geophysical techniques to evaluate the size and quality of the copper ore body, this is followed by rigorous metallurgical testwork to determine the most effective extraction methods.

The pilot plant development for a small-scale in-situ copper recovery (ISCR) field at the project location is crucial for evaluating the feasibility of ISR. It serves as a scaled-down version of a full-scale operation, allowing for the testing and optimisation of key processes before large-scale production. The pilot plant's objectives include assessing leaching solutions, evaluating ore body permeability and flow characteristics, and testing copper recovery methods.

The engineering studies and design phase commenced with a trade-off study, which evaluated various technical options for mining methods, processing technologies, and infrastructure requirements to select the most cost-effective and feasible approach. The scoping study provides a preliminary assessment of the project, including potential mining methods, processing options, costs, and environmental impacts. The pre-feasibility study, feasibility study and definitive feasibility study then offers a comprehensive evaluation of the project's viability, including detailed engineering designs, cost estimates, and risk mitigation strategies, serving as the basis for securing financing and advancing to development. Front end engineering design (FEED) involves the detailed planning of the ISR field and processing plant, ensuring all technical aspects are addressed and laying the groundwork for construction.

The project implementation phase involves transforming the engineering designs and plans into a functioning ISR well field and processing facility. This phase encompasses project scheduling, procurement, and construction activities. Project scheduling involves creating a detailed timeline for all activities, ensuring the project stays on track and within budget. Procurement and contracting focus on acquiring the necessary equipment, materials, and services, selecting contractors, negotiating contracts, and managing supply chains. The construction and implementation phase includes the actual building of the ISCR field, processing plant, and associated infrastructure.

Operational readiness and handover phase prepares the project to transition from construction to production. This phase includes workforce training and development, ensuring that the operations team has the necessary skills and knowledge to manage the ISR field and processing plant efficiently. Operational systems and procedures are established to guide daily operations, covering aspects such as maintenance schedules, safety protocols, and quality control measures. Finally, the project handover marks the formal transfer of the project from the construction team to the operations team, including the completion of all construction activities, final inspections, and the transfer of documentation and operational systems.

2. RECOMMENDATIONS & FUTURE WORKS

During the Scoping Study, key tasks and priorities for future work were identified by the various discipline consultants involved in the Study. They are not fully inclusive and some of the tasks are typical requirements addressed during future phases of study. The intent is to highlight the recommended major focus and emphasis of this work.

Key recommendations from this scoping study and for the further development of the Cobre Ngami Copper Project in Botswana are as follows:

2.1 Studies and Piloting

- Pilot ISCR plant
  - Demonstrate the in-situ copper recovery of the ore with a pilot plant operation on site. This will provide valuable data for future studies and simulations
  - Develop a pilot plant study design and execution plan
- Complete the Cobre ISCR Project Prefeasibility Study
  - Complete Engineering and Design for the in-situ copper recovery operation to prefeasibility level requirements
  - Develop Capital and Operating Estimates to a AACE Class 3 Estimate Level (+30% to -20%)
  - Complete Financial Modelling for the project based on the Prefeasibility Study CAPEX and OPEX models

2.2 Geology

- Drilling Campaign
  - Undertake more drilling to establish a resource to support the development of the first ISCR wellfield

2.3 Hydrogeology and Hydrology

- Hydrogeology studies must be conducted to determine the locations of these boreholes and assess their water quality and content
- Addition consideration for borehole placement to source water is in future ISCR wellfields. The aquifer could be drained ahead of ISCR wellfield development allowing for water to be sourced closer to site.
- Use of reverse circulation multipurpose holes during resource drilling to assess hydrogeological conditions along the strike of mineralisation

2.4 Metallurgical Testwork

- Mineralogy Testwork
  - Core and ore samples must be submitted for mineralogy testwork. Programmed Mineralogy testwork such as X-Ray Diffraction and Quantitative evaluation of minerals by scanning electron microscopy (QEMSCAN) must be developed and undertaken on select drill holes at select intervals as well as injection and extraction wells in due course.
  - Mineralogy testwork underway on first drill core samples submitted for analysis.
- ISCR Specialist Testwork
  - Perform specialised leaching tests on core or half core material from different drill holes
  - Develop a process for performing specialised ISCR leach tests (e.g. leach box tests) and continue this during infill drilling campaigns.
  - Develop a process for performing ISCR leach tests (e.g. leach box tests) on material from injection and extraction wells to improve understanding of the relationship between geology, mineralogy, geochemistry and leaching of the orebody. This will aid the prediction of metal recovery, leach kinetics, determination of leaching models, assist with reagent usage and aid metallurgical accounting and reconciliation in both the solution mining operations and the processing plant.
- Solvent Extraction
  - Complete some shakeout tests on the pregnant leach solution (PLS) from the leaching testwork to test the copper extraction performance.
- Precipitation Testwork
  - Complete precipitation and crystallisation testwork to produce silver precipitate and copper sulphate crystallisation

2.5 Insitu Copper Recovery (ISCR)

- Pilot ISCR plant
  - Demonstrate the in-situ copper recovery of the ore with a pilot plant operation on site. This will provide valuable data for future studies, simulations and leach modelling.
- Mining Hybrid Strategy
  - Future consideration of implementing in-situ copper recovery from an underground placement. Could potentially provide an economic benefit. Future consideration and trade off against ISCR from surface.

    - Future consideration of a hybrid underground and ISCR operation. Could potentially provide an economic benefit for mining out high-grade pockets to a surface heap leach pad.

2.6 Processing

- Plant Location Study
    - A detailed study to identify an economically viable location for Stage 1 and Stage 2 processing facilities in relation to the resource.
- Reagent Consumption
    - Future work to optimise reagent consumption. Currently due to study level and limited testwork data available, process simulation uses high level assumptions to model downstream processing. This can be optimised in future study work.
- Excess Water Management
    - Water impoundment ponds to manage excess water during operation when building PLS tenors and rinsing exhausted fields.
    - Evaporation pond to discharge excess water and assist with water management.
- Neutralisation Plant
    - Consideration at scoping level has not been given to evaporation ponds and as such no consideration to the neutralisation of the solution prior to discharge to these evaporation ponds.
    - Consideration of neutralisation of tailings from the thickener to the tailings pond. This is a future consideration to manage this acid tailings.
- Removal of impurities from processing circuit.
    - Consideration at the scoping level has not been given for a solvent extraction scrubbing stage to handle the build-up of iron in the ISCR and processing circuit nor for strategies to remove other impurities from the circuit. This can be optimised in future studies and with future testwork.

2.7 Infrastructure

- Power study
    - Currently due to the distance from the highway of 50 km. The scoping study has assumed power generation onsite will need to utilise diesel generators during Stage 1. It has been assumed that for the ramp up to Stage 2 grid power will be utilised. Additional investigation into agreements and opportunities to connect the site to the grid is warranted. Grid connection will benefit the operation reducing the operating cost as power is a large contributor to the current OPEX.

2.8 Logistics

- Logistic study
    - An in-country logistics study needs to be undertaken to evaluate the viability of the options presented in this scoping study.

2.9 CAPEX and OPEX

- Develop Capital and Operating Estimates to a AACE Class 3 Estimate Level (+30% to -20%)
- Undertake request for quotation and tender bid evaluation process for equipment.

2.10 Marketing

- Establish offtake agreements for products.

2.11 Financials

- Complete Financial Modelling for the project based on the Prefeasibility Study CAPEX and OPEX models

2.12 Risk and Opportunities

- Conduct workshops to review and refine Risk Matrix.
- Action mitigations.
- Consideration for social licensing with early-stage community engagement

3. INTRODUCTION

Cobre Limited is an emerging resources exploration and development company with prospective projects in both Botswana and Western Australia. Cobre's enriched, high grade copper discoveries and high-grade pipeline seeks to underpin copper's future growth in the electric vehicle and renewable energy sectors. Figure 3-1 shows Cobre's robust exploration and development pipeline for high-quality copper resources.

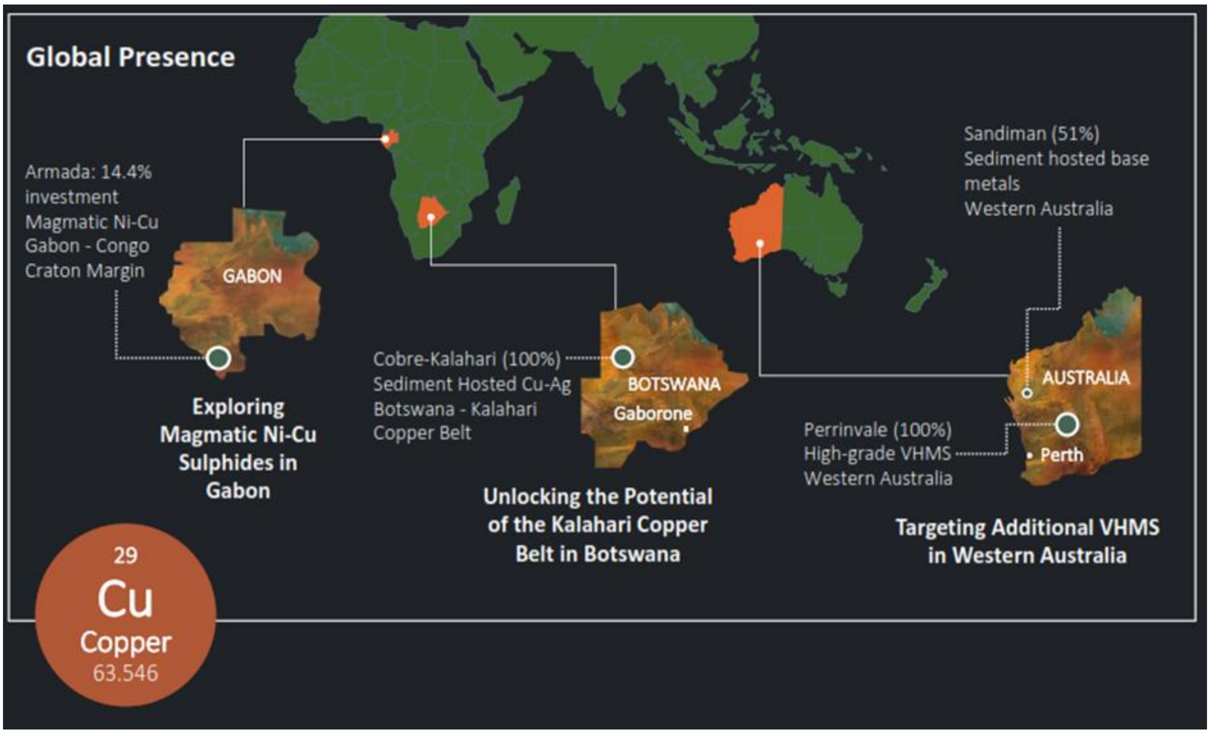

Figure 3-1 Cobre's Global Copper Presence

There is potential for a significant moderate grade copper deposit to host an In-situ Copper Recovery Project at Ngami Copper Project in Botswana The benefit of these project area is they lie along strike and adjacent to producing mining operations like Cupric Canyon and Sandfire.

At the Ngami Copper Project hydrogeological drilling commenced during the final quarter of 2023 designed to test the viability of an in-situ copper recovery (ISCR) process to extract copper-silver mineralisation. The viability for employing ISCR process was further supported by the results of metallurgical testwork that demonstrated high recoveries of both copper and silver by adding ferric sulphate and chloride to the leach system.

Mr Adam Wooldridge, Chief Executive Officer of Cobre Limited requested Damian Connelly, Principal Consulting Engineer from METS Engineering undertake a Scoping Study on an In-situ Copper Recovery (ISCR) Project for the Ngami Copper Project (NCP) in Botswana, Southern Africa.

3.1 Project Background and Location

Cobre Limited has a focus on the Kalahari Copper Belt (KCB) in Northern Botswana, which is one of the most prospective areas globally for new sedimentary copper discoveries. The company has 100%-ownership of highly prospective copper and silver exploration tenements in the KCB area. This is the second largest tenement package in the KCB. This tenement consists of four project areas:

- Ngami Copper Project (727 km^2),
- Kitlanya East (1,359 km^2),
- Kitlanya West (1,900 km^2), and
- Okavango (1,362 km^2).

These project areas can be pictured in Figure 3-2.

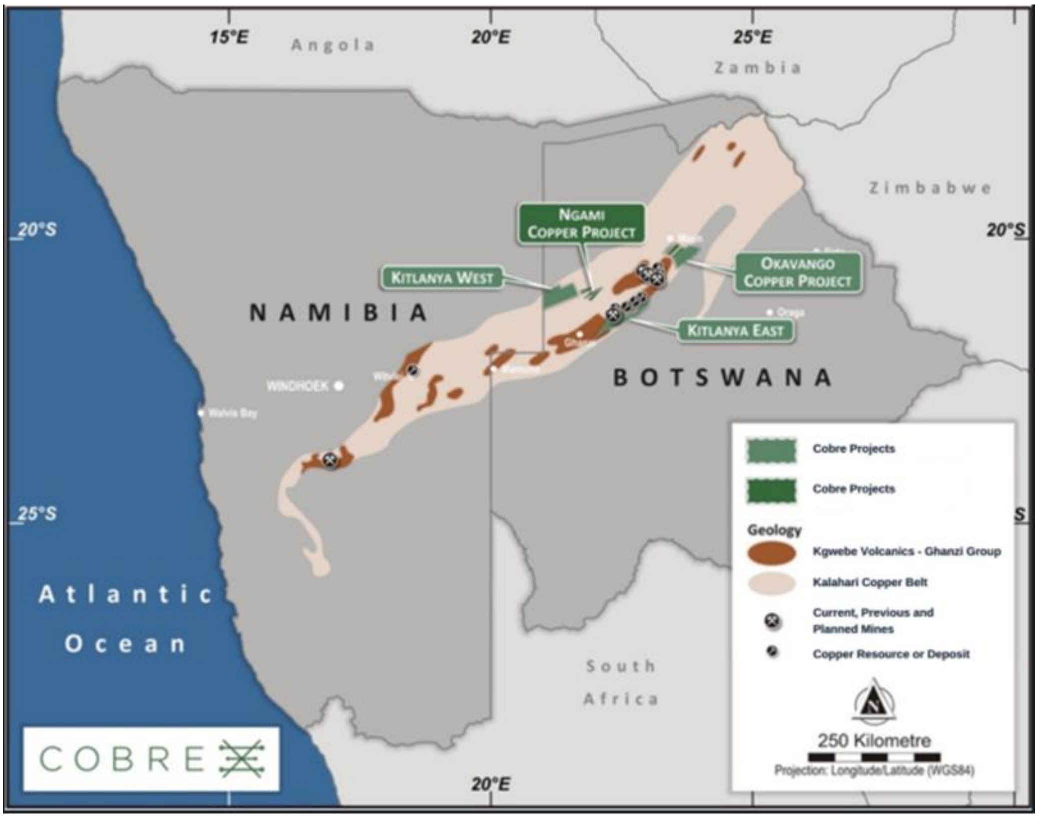

Figure 3-2 Kalahari Copper Belt and Cobre - Kalahari Tenure Position

3.2 Climate and Geography

This study is based on the Ngami Copper Project (NCP) which covers an area of 727 km^2 in a sparsely populated region in the Ngamiland district. The climate of the project area is arid. Rainfall is highly variable and unreliable, with averages between 300 and 500 mm per annum.

The annual temperatures range between 20 and 22 degrees Celsius. The Kalahari Copper Belt Project is situated in a region of savanna vegetation with an elevation and altitude averaging between 900 and 1000 m above sea-level.

3.3 Study Objectives

The scope of this study is to provide a process design and financial estimate of an ISCR process for Cobre's Ngami Copper Project (NCP). The key objectives of the work undertaken in this study are outlined as follows:

- Conducting a Process Design Study to a scoping study level. Based on the required study accuracy of a scoping study to achieve an estimate accuracy +50% to -30% (AACE Class 4 Estimate) with a project definition of 3% to 15%
- Conduct an Economic Study to a scoping study level. Based on the required study accuracy of a scoping study to achieve an estimate accuracy +50% to -30% (AACE Class 4 Estimate) with a project definition of 3% to 15%
- Plan, develop and analyse metallurgical testwork
- Investigate market demand and competitive product appeal
- Recommend the project configuration for mining, processing, logistics and export, to be further optimised during subsequent design phases
- Establish key areas for value improvement which will be studied and evaluated at subsequent design phases set the basis of implementation and timing for both the business establishment and project execution phase
- Develop a risk assessment involving risk identification and mitigation

3.4 Key Study Contributor

Cobre appointed industry specialists to consult on the development of the Ngami Copper Project. METS Engineering, acted as the principal consultant in the integration of the scoping study. The main contributors and consultants engaged for the study and their contributions are shown in Table 2 1.

Contributor	Area of Responsibility
Cobre Limited	Study management and coordinating, geology, land tenure and permitting, environmental input and stakeholder information

Contributor	Area of Responsibility
METS Engineering	Management and execution of metallurgical testwork program, process design, preliminary engineering design, CAPEX & OPEX estimates, financial modelling, and risk assessment
AXT Pty Ltd	Mineralogy analysis
ALS Metallurgy Pty Ltd	Mineral processing testwork – leaching and assays
Altair Mining Consultancy	Mining study, pit design, mining modelling, development of mining cost estimates and mining method
B & S Geological	Mineral resource estimation, 3D geological and mineralisation model development
WSP	Hydrology and ydrogeology analysis. Wellfield modelling and design.

4. MINERAL RESOURCE

4.1.1 Ngami Copper Project (NCP)

Highly prospective copper and silver exploration tenements containing consistent moderate grade chalcocite dominant mineralisation have been intersected in drilling along extensive strike lengths.

Structurally controlled high-grade intersections include:

- 9.3 m @ 3.4% Cu and 30 g/t Ag(downhole)
- 10.7 m @ 1.3% Cu and 18 g/t Ag (downhole)

With extensive strike extensions yet untested for mineralisation this area has potential to host both high-grade and large moderate grade deposits. There hasn't been enough exploration for the Ngami Copper Project to estimate a mineral resource, and it is unclear if more exploration will lead to the estimation of a mineral resource. As a result, the estimations of tonnage and grade for the exploration target category are conceptual in nature. Table 4-1 shows the conceptual results and Figure 4-1 shows an illustration of the results.

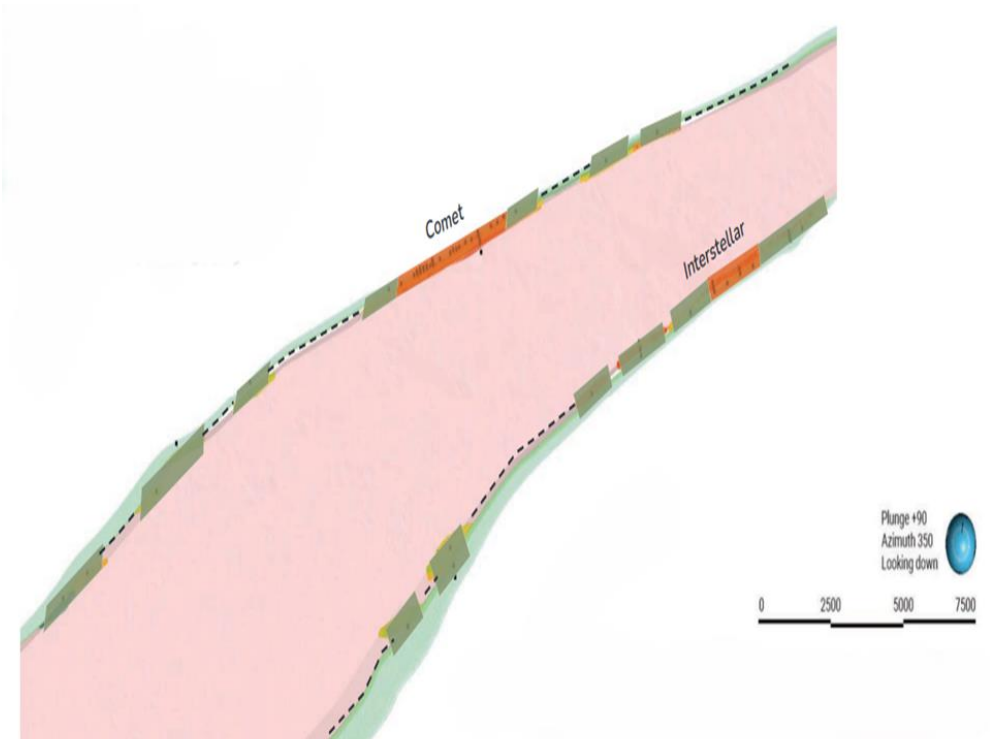

Figure 4-1 NCP Modelling Highlights Significant Scale and Untested Upside

Table 4-1 Conceptual Mineral Resources

Tonnage			Cu%			Category
Mean	Min	Max	Mean	Min	Max	

	23.4	18.3Mt	28.4Mt	0.50 %	0.45%	0.55%	Exploration Target 1
	111Mt	85Mt	137Mt	0.40%	0.36%	0.43%	Exploration Target 2
- - - -	Untested contact ~20km						

Figure 4-2 illustrates the company's four project areas together with existing mines and significant deposits.

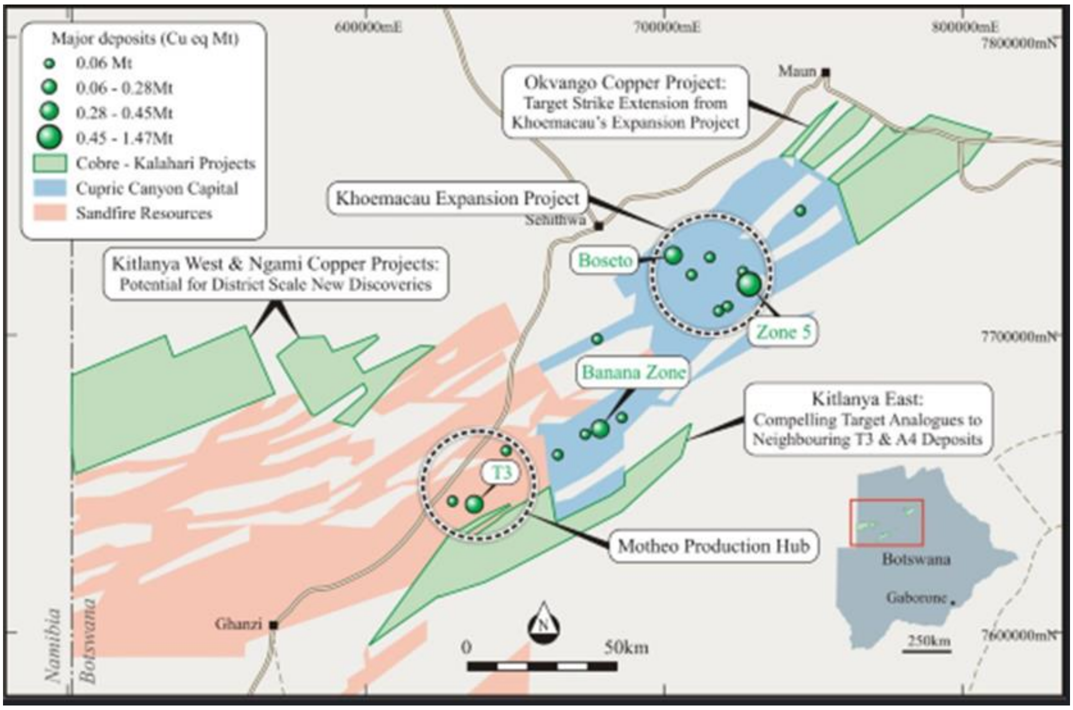

Figure 4-2 Kalahari Copper Belt Tenure Position and Significant Deposits

4.1.2 Current Project Position

There is potential for a significant moderate grade copper deposit to host an In-situ Copper Recovery Project. Both the Ngami Copper Project and Kitlanya West Projects present potential for accelerated development opportunities and potential in Botswana. The NCP area is situated near the northern margin of the KCB, where most known deposits are found. It is located east of the Kitlanya West collectively covering a substantial portion of the prospective KCB stratigraphy.

Cobre commissioned B&S Geological to assess the mineral endowment and WPS to conduct a groundwater assessment for the Ngami Copper Project. All the geological and hydrological information provided in this scoping study was obtained from the Model Handover Note dated August 2023 and the Preliminary groundwater assessment dated September 2023 respectively. At the NCP, hydrogeological drilling commenced during the final quarter of 2023. It was designed to test the viability of an in-situ copper recovery (ISCR) process to extract copper-silver mineralisation. The viability for employing ISCR process was further supported by the preliminary leachability metallurgical testwork results that demonstrated high recoveries of copper and additional silver using ferric sulphate and hydrochloric acid.

5. GEOLOGY

The Ngami Copper Project (NCP) is a sedimentary hosted, structurally controlled system with a copper silver mineralisation situated approximately 70 m below Kalahari sands within the Kalahari Copper Belt (KCB), Botswana.

The project area encompasses two significant anticlinal features, offering more than 100 km of prospective contact between the Ngwako-Pan (red beds) and D'Kar Formation (marine sedimentary rocks), known for traditional limb-based mineralisation. An illustration of the mineralisation associated with structures at the contact of the D'Kar Formation (DKF) and the Ngwako Pan Formation (NPF) is shown in Figure 5-1.

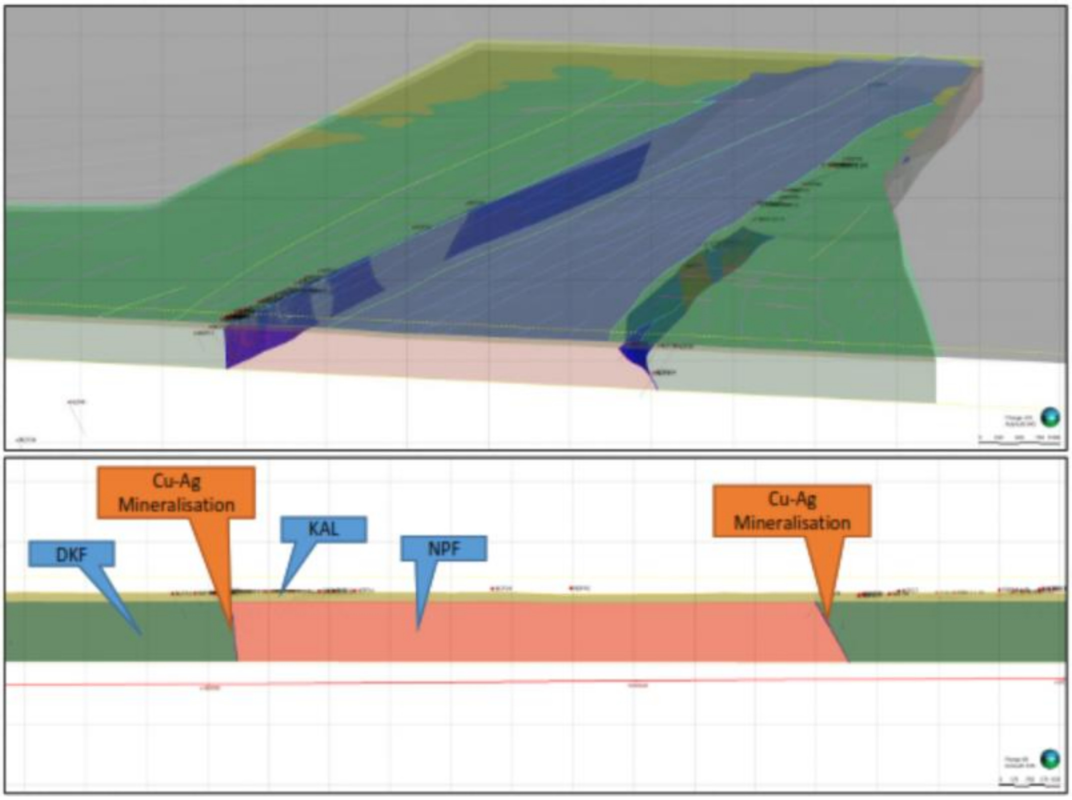

Figure 5-1 Section looking NE – Antiform Subcrops ~70 m Below the Kalahari Sands. Mineralisation Associated with Structures at the Contact of DKF and NPF

- KAL - Unconsolidated and Semi-consolidated Kalahari Sands.
- DKF (D'Kar Formation) - sandstones, siltstones, shales, conglomerates. Primary host for mineralisation.
- NPF (Ngwako Pan Formation) red beds – sandstones, siltstones, shales and mudstones.
- Cu-Ag Mineralisation - mineralisation at the contact between the DKF and NPF.

The mineralisation is sediment hosted, strata bound and structurally controlled and associated with the redox boundary at the DKF – NPF contact. The DKF is the main mineralised host while the NPF displays minor to no mineralisation. Frequently the higher grades are associated with and in close proximity to the contact DKF – NPF but may extend higher into the DKF stratigraphy with occasional stacked mineralised sequences associated with favourable controlling structures.

Key geological features of the area include:

- Kalahari Sands (KAL): Unconsolidated and semi-consolidated sand and calcrete serve as the most common overburden in the region with approximate thicknesses of up to 70 m. The lower part may contain semi-consolidated calcretised sand
- D'Kar Formation (DKF): Primary host of the mineralisation comprising a sequence of reduced marine sedimentary rocks, sandstones, siltstones, shales and minor conglomerates overlies the Ngwako Pan Formation red beds.
- Ngwako Pan Formation (NPF): Consists of sandstones, siltstones, shales and mudstones that exhibit a characteristic red colouration due to the abundance of iron oxide coatings on the sand grains forming the bulk of the formation.

Total over burden depth decrease from Comet towards the northeast. Based on groundwater measurements the Kalahari sands are expected to be saturated.

The elevation data for the site is as follows:

- Ground surface: 1102 m RL to 1099 m RL
- Depth of Kalahari sands: 70 m or 1030 m RL
- Depth of groundwater: 970 m to 992 m RL
- Groundwater level rise before reaching Kalahari sands: 30 m to 60 m
- Groundwater level rise before reaching ground surface: 95 m to 117 m

5.1 Domains

Mineralised domains are based on drilling assay information and were created using Leapfrog Geo™ software. Two cut-offs were chosen for the project's categorisation:

- Higher grade (Cu % > 0.5) – (HG)
- Lower grade Mineralised Halo (Cu % 0.2 – 0.5) – (MH)

Four discrete mineralised halo domains were identified in the northern limb and three in the southern limb. Higher grade domains were created within each mineralised halo at a 0.5 Cu% cut-off. A custom reference surface was used to guide the veining tools (Radial Basis Function) RBF for dip and azimuth. The DKF –NPF surface was used for the mineralised halo (MH) while higher grade (HG) domains use their respective MH to guide the orientation.

5.2 Drill Program

The primary focus for the program was to target the high fracture zones associated with the lower mineralised cycle of the D'Kar Formation. Drilling focused on the southern anticlinal structures (extends ~40 km) with mineralisation on both southern and northern limbs displaying fine grained chalcocite within the cleavages, along parting planes and fractures.

The drill hole database includes 78 diamond HQ core holes that have been completed over three phases of drilling with information recorded including lithology, structures, selected fracture orientation, geotechnical (Rock Quality Designation (RQD), core recovery, fracture count), assays and core photography. The 78 holes total 16,465 m drilled with an average depth of 209 m. The drilling covers distances along strike in the order of 20 km on the northern limb and 17 km on the southern limb and as shown in Figure 5-2, with higher density drilling at the Comet deposit (northern limb) and the Interstellar deposit (southern limb).

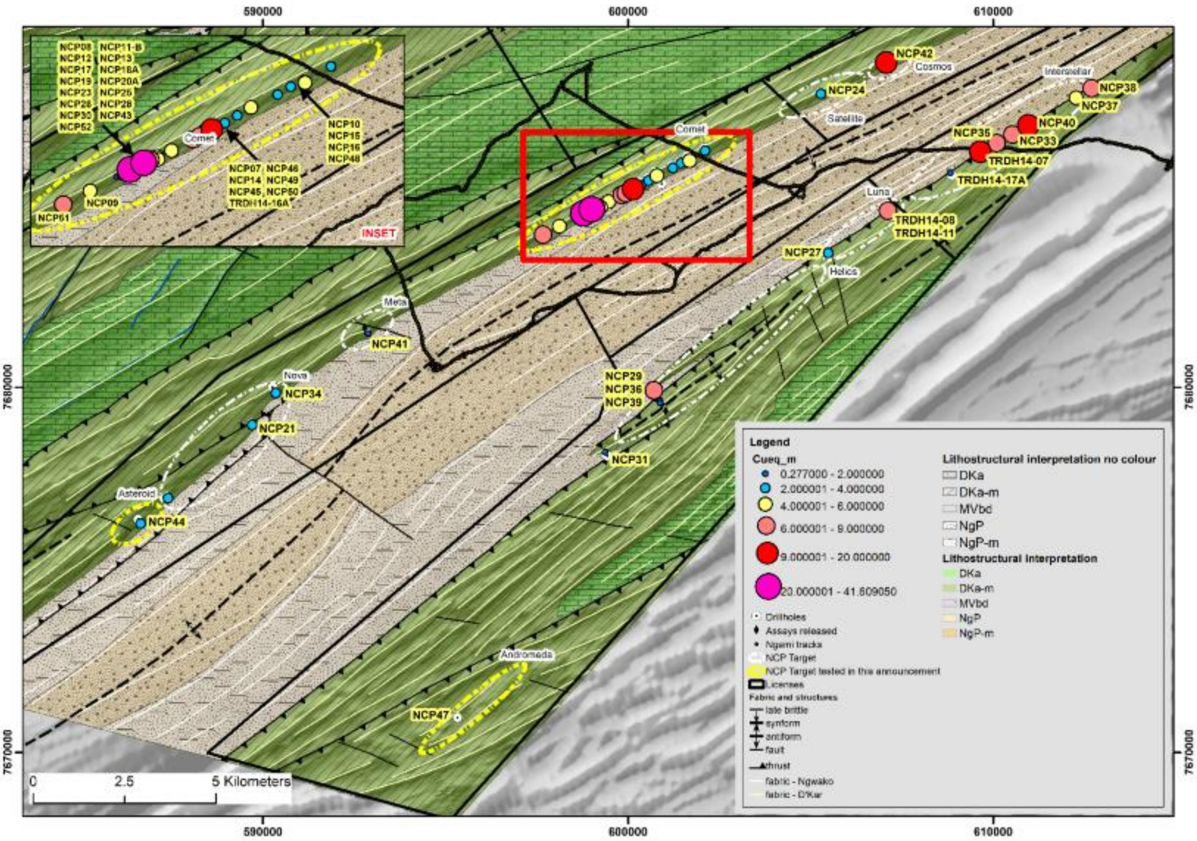

Figure 5-2 Drill Hole Locations

The extensive drilling programme at NCP, the drilling has intersected sedimentary-hosted, strata bound and structurally controlled, copper-silver (Cu-Ag) mineralisation on the limbs of anticlinal structures. This mineralisation is associated with the redox contact between oxidised Ngwako Pan Formation red beds and overlying reduced marine sedimentary rocks of the D'Kar Formation. The assay of the drill core revealed significant and consistent intersections of moderate-grade copper-silver (Cu-Ag) mineralisation along extensive strike lengths, suggesting the presence of potentially large, moderate-grade copper deposits that stretch over tens of kilometres on both the northern and southern limbs of the targeted anticline.

Most exploration holes on the Comet deposit exhibit low Rock Quality Designation (RQD) which is associated with fractured zones with multiple joint sets. The highest degree of fracturing was encountered at depths ranging from 120 to 200 m (downhole) that extends beyond 200m increasingly from west to east at Comet and continuing to greater depths at Interstellar. RQD core photographs show fractures and brecciated fault zones commonly associated with copper mineralisation. Copper mineralisation is hosted in fractures which appear relatively porous and permeable and from an injection standpoint this will allow the injection fluid to easily flow through the mineralisation. Alternatively high zones of permeability mean higher rates of recharge, and this promotes the lateral spreading of the injectant even under low injection pressure.

Detailed fracture logging has been undertaken on drill holes across the Comet Target in NCP. More intense fracture zones running parallel to the primary mineralised contact are bounded by more competent zones in the footwall Ngwako Pan Formation. Two fracture zones have been identified that are expected to control ground water movement and should focus any injected fluid into the mineralisation.

ALS Goldspot were commissioned to run their deep learning Litholens AI software on all diamond drill core photos from Comet to provide a fracture count per metre and a rock stability index which was then gridded to produce a 3D numerical fracture model using the established fracture orientation controls. The result demonstrates that the correlation of fracture patterns with mineralisation is consistent along the length of the target and provides a useful tool for estimating pathways for fluid flow. This information may prove useful for predicting solution pathways for lixiviant flow through the well field and possibly aid the positioning of extraction and injection wells

6. HYDROGEOLOGY AND HYDROLOGY

WSP prepared a report to assess the potential for In situ Copper Recovery (ISCR) of the mineralised copper horizons in Cobre Limited's Botswana sedimentary hosted Ngami Copper Project. The assessment was conducted in three stages:

- Stage 1: Desktop Assessment
- Stage 2: Field Investigation
- Stage 3: Numerical Modelling

The complete report is available in Appendix J.

6.1 Hydrogeology

For economic recovery of copper using in-situ leaching certain hydrogeological conditions must be present within an ore body such as;

- A saturated body.
- Sufficient porosity and permeability (hydraulic conductivity) within the fractured bedrock.
- Hydraulic connection between the injection and recovery wells so leach solution can circulate through the mineralised bedrock; and
- Lixiviant /mineral contact and adequate lixiviant retention time.
- Moreover, deep groundwater levels are preferred to minimise the risk of injectant or groundwater returning to the surface or migrating to areas that are not the target for leaching.

6.2 Hydrogeological Setting

The NCP area is situated near the northern margin of the Kalahari Copper Belt, where the majority of known deposits in the KCB are found. It includes a significant strike of the sub-cropping contact between the Ngwako-Pan and D'Kar Formations, which is considered highly prospective for mineralisation.

Copper-silver mineralisation associated with the redox contact between oxidized Ngwako Pan Formation red beds and the underlying reduced marine sedimentary rocks of the D'Kar Formation. These mineralisations occur on the limbs of anticlinal structures.

The key geological units in the NCP area include:

- Unconsolidated and Semi-consolidated Kalahari Sands: These sands have a thickness of approximately up to 70 meters. The lower part consists of semi-consolidated calcretised sand.
- D'Kar Formation: This formation comprises reduced marine sedimentary rocks, such as sandstones, siltstones, shales, and minor conglomerates and is the primary host of mineralisation. These sedimentary rocks are predominantly found on the limbs of anticlinal structures and overlie the Ngwako Pan Formation red beds, forming the hanging wall.

- Ngwako Pan Formation (NPF) Red Beds: This unit consists of sandstones, siltstones, shales, and mudstones that exhibit a characteristic red coloration due to the abundance of iron oxides. These rocks form the footwall in the area.

Higher-grade copper mineralisation is found along the Ngwako Pan/D'Kar Formation contact, within a sub-vertically dipping fracture zone.

The hydrogeological investigations involved drilling two production wells (PW001 and PW002), which intersected subvertically dipping mineralisation associated with the target fracture zone, and several monitoring wells to assess the hydraulic properties of the aquifer, including groundwater flow direction, permeability, anisotropy, and groundwater quality.

6.3 Groundwater Flow and Direction

The depth to the groundwater level in all test wells and formations was consistent, measured at 124 meters below ground level (m bgl) or 978 meters Reduced Level (RL), approximately 48 meters below the base of the KAL formation. This significant depth is advantageous for injection, as it allows higher rates without the risk of water surfacing or leaking upwards into the KAL.

Copper mineralization occurs at 1026 m RL and remains open-ended. Based on the current groundwater elevation, a small portion of copper mineralization exists above the water table. Injection trials confirmed the feasibility of increasing the water table by inducing a small groundwater mound through injection, potentially facilitating copper dissolution above the current water table.

Ongoing groundwater level monitoring is being conducted to determine seasonal fluctuations. The groundwater elevation is expected to follow the landform, being higher elevation beneath basement highs and lower beneath basement lows.

6.4 Hydraulic Parameters, Storativity and Anisotropy

Aquifer testing, including slug, injection, and pumping tests, was conducted to determine hydraulic parameters such as hydraulic conductivity (K), transmissivity (T), storativity (S), and specific storage (Ss). These tests revealed the following key hydraulic characteristics for each formation:

- Hydraulic Conductivity (K): Copper-silver mineralisation along the redox boundary between the Ngwako Pan Formation and the D'Kar Formation exhibits moderate to high permeability. Hydraulic conductivity values range from 0.2 to 0.5 m/d (based on PW001), with hydraulic conductivity decreasing with depth, as seen in deeper well PW002.
- Specific Storage (Ss): Specific storage values calculated from monitoring wells ranged from 3.98×10^{-6} to 7.4×10^{-5} 1/m, indicating the aquifer's ability to store and release water.
- An anisotropy ratio as low as 0.001 suggests strong directional flow along the fracture plane.
- Footwall and Hanging Wall Seals: These formations exhibit significantly lower permeability (K values as low as 0.0008 to 0.001 m/d), providing natural barriers that confine the lixiviant within the mineralised zone

- Strong hydraulic connectivity between the production wells, particularly PW001 and PW002 (80 m apart), was confirmed. The observed anisotropy is critical for guiding fluid flow towards recovery wells, ensuring that the lixiviant remains confined within the mineralised copper-silver zone.

The analysis confirmed strong hydraulic connectivity between the production wells, particularly PW001 and PW002, located 80 meters apart. The anisotropy observed in the aquifer is critical for guiding fluid flow towards the recovery wells, ensuring that the injected solution remains within the targeted copper mineralisation.

6.5 Horizontal and Vertical Connectivity

Despite the reduction in hydraulic conductivity with depth, the fracture system at the NCP exhibits both horizontal and vertical hydraulic connectivity:

- Horizontal Connectivity: The pumping and injection tests demonstrated strong horizontal connectivity between PW001 and PW002, which are located 80 meters apart. This connectivity is aligned with the strike of the mineralised zone and suggests that fluid flow is concentrated along sub-horizontal fractures, facilitating lateral movement of injected solutions. Monitoring wells, particularly MW012, which intersected the mineralised zone, showed direct and rapid responses to pumping and injection tests, further confirming lateral flow along the fracture plane.
- Vertical Connectivity: Although hydraulic conductivity decreases with depth, the tests indicate that vertical connectivity is present between different levels of the fracture zone. During the combined pumping and injection test, the drawdown in PW002 was buffered when water was injected into PW001, suggesting that fluid moved vertically between the shallower and deeper sections of the fracture zone.

This dual horizontal and vertical connectivity is important for the ISCR process, as it allows injected lixiviant to permeate through the mineralised fracture zone both laterally and vertically, dissolving copper and facilitating its recovery. The stronger horizontal flow ensures that the lixiviant spreads efficiently along the strike of the mineralisation, while the vertical connection enables fluid transfer between upper and lower sections of the ore body.

6.6 Groundwater Salinity and Chemistry

The groundwater in the area has moderate salinity levels, with electrical conductivity (EC) values ranging from 1466 µS/cm to 1593 µS/cm. The recharge water used during injection tests had an EC of 1000 µS/cm, and a noticeable decrease in EC during injection suggests that the lixiviant is efficiently dispersing and interacting with the mineralised zone.

6.7 Conclusion

6.7.1 Feasibility of ISCR

Site characterisation efforts have focused on existing geological data and conducting a field program, including the installation of pumping/injection wells and monitoring wells. A series of pumping and injection trials were undertaken to assess key hydrogeological parameters, such as hydraulic conductivity and storage capacity, as well as assessing the aquifers' ability to undergo injection and pumping.

Economic recovery of acid-soluble copper using ISCR requires specific hydrogeological conditions:

- Saturated Ore Body: The ore body must be saturated.
- Porosity and Permeability: Adequate porosity and hydraulic conductivity within fractured bedrock are essential to allow leach solution circulation through the Cu mineralisation
- Hydraulic Connectivity: There must be a hydraulic connection to promote fluid movement between injection and
- recovery wells.
- Lixiviant Contact and Retention: Effective mineral contact and sufficient lixiviant retention time are critical.
- Additionally, deep groundwater levels are preferred to minimise risks of injectant return to the surface or migration to non-target areas.

6.7.2 Aquifer Potential

The aquifer in the study area demonstrates strong potential for ISCR. Key findings include:

- Drilling and injection Tests: The aquifer supports injection rates of at least 3 L/s per well, with potential for higher rates.
- Anisotropy and hydraulic: The aquifer is anisotropic, with higher permeability (K = 0.5 m/d) along high density fracture zone associated with the lower mineralised cycle of the D'Kar Formation.
- The hydraulic conductivity of the mineralised fracture zone is ~0.2 m/d to 0.5 m/d and falls within the ISR feasibility window defined by Abzalov (2012) and recommended by IAEA (IAEA 2016).
- The fracture zone is bounded by lower (less-permeable) fracture counts associated with the underlying Ngwako Pan Formation footwall and overlying sandstone packages in the D'Kar Formation which provide lateral seals.
- The flow direction aligns with primary fracture mineralisation which facilitates solution to permeate through and dissolve the copper and fluid transfer between injection and recovery wells with minimal losses.
- Injection efficiency: A small injection rate raised the water table by 10 meters at 25 meters from the injection point, indicating the feasibility of accessing copper mineralisation above the water table.
- The retention time is expected to be sufficient, given compartmentalisation associated with mineralisation, demonstrated by the slow recession curves, post injection.
- Depth to water table is 124 meters below ground and is ideal for ISCR. This appears to be an optimal depth, sufficiently below the Kalahari cover to ensure fracture control preventing lateral migration, with a small portion of the orebody exposed above the water table.
- The above conditions allow for lixiviant to be circulated through the ore body, with sufficient contact and retention time with acid soluble copper in the ore body.

Potential wellfield array:

The characteristics of an aquifer, such as its extent and anisotropy, play a crucial role in determining the appropriate wellfield array for ISCR operations. In this case the aquifer exhibits strong anisotropy (narrow zone of enhanced permeability bounded by structural features of lower permeability) and as such a wellfield array consisting of a regular row of evenly spaced wells may be suitable. In this arrangement, rows used for injection alternate with rows used for extraction, which is known as line drives or alternating line drives.

To inform this the next phase of work, involves groundwater modelling is being undertaken to simulate the optimal number and spacing of injection and recovery wells, ensuring efficient and effective implementation of the in-situ leaching operation.

7. METALLURGICAL TESTWORK

7.1 IMO Testwork

Initial metallurgical testwork was completed in November 2023 by Independent Metallurgical Operations Pty Ltd (IMO). The aim of the testwork was to determine the leaching potential of the ore body. A serious of drill samples were taken, with the samples used in this testwork being course rejects remaining from previous assay tests. The materials had a crush size P_{90}, of 2 mm.

Two composite samples were generated for the testwork. The samples were made to produce a high grade (HG) and low grade (LG) composite. The HG composite had a head grade of approximately 2.72% Cu, while the LG composite had a head grade of approximately 0.56% Cu.

Acid leach testing was conducted on both composites using an intermittent bottle roll (IBR) leach test to assess the potential copper recoveries via sulphuric acid leaching. The tests used the following conditions:

- 20% solid density w/w, diluted in Perth tap water
- Bottle rolled at a rate of 5 minutes every hour
- pH 1 maintained using sulfuric acid
- Initial concentration of Ferric ions (Fe^{3+}) of 2 g/l from the addition of Ferric sulphate, $Fe_2(SO_4)_3$
- Eh to be maintained at approximately 400 mV (Ag/AgCl electrode)

High chalcocite content present in the ore body requires the addition of ferric sulphate to facilitate the leach conditions. It targets the oxidation of copper sulphide minerals to allow their extraction with acid.

Using IBR, kinetic leach curves were generated. Kinetic Leach Curve R1-1 and R1-2 are the HG composite and LG composite respectively.

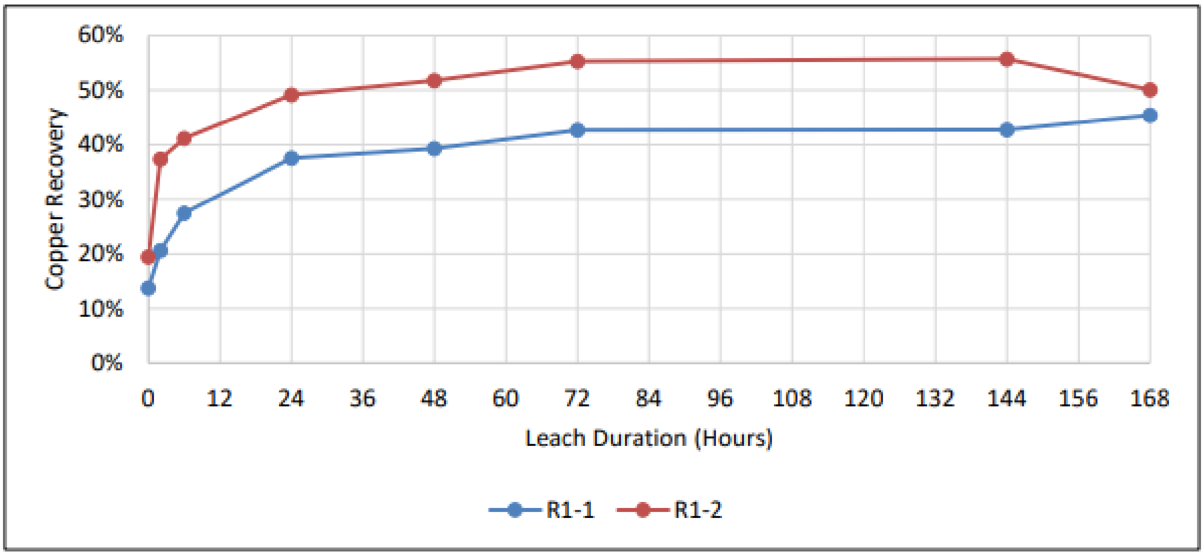

Figure 7-1 IMO Stage 1 Leach Kinetic Curves

For HG and LG composites:

- Overall leach recoveries are 45.4% and 50.0% respectively
- When mixing the samples in solution, fast leach kinetics were observed, with the solution turning blue. The copper recoveries after the first of couple minutes were 13.7% and 19.5% respectively. The fast leaching is likely caused by readily soluble copper minerals (chrysocolla/malachite), instead of the primary ore chalcocite
- Leaching plateaus at around 72 hours for both samples.
- Residue copper grades of 1.40% and 0.25% respectively
- No Silver recovery was reported
- Ferric Sulphate consumptions were 107 kg/t and 37 kg/t respectively

Sulphuric Acid consumptions were reported at 86 kg/t and 79 kg/t respectively

Copper recoveries across the board were much higher than the acid soluble copper content that has been reported in previous head assay analysis, which was sitting at less than 10% (8.8% and 9.9% respectively) solubility. Because the leaching was much higher it indicates that the addition of ferric sulphate can promote the oxidation of copper species much less willing to be leached through traditional acid processes.

The drop in recovery in R1-2 is likely due to a sampling error throughout the testwork. The values recorded as the final leach liquor concentration is more indictive of copper extraction. Leaching results indicate that the chalcocite has been converted from Cu_2S to CuS (covellite). This would result in one copper being released for each chalcocite molecule and explain the final recovery of around 50%.

After the first two leaching tests (Figure 8.1), a series of further tests were conducted with changes to the operating conditions to determine optimal leaching techniques. These tests can be seen in Table 8-1

Table 7-1 Metallurgical Testwork Operating Changes

High Grade Composite		Low Grade Composite	
Sample	**Changes**	**Sample**	**Changes**
R1-1	Default Conditions	R1-2	Default Conditions
R2-1	Increased E_H	R2-6	Increased E_H
R2-2	20g/L Chloride	R2-7	20g/L Chloride
R2-3	100g/L Chloride	R2-8	100g/L Chloride
R2-4	$KMnO_4$ used as Oxidising Reagent	R2-9	$KmnO_4$ used as Oxidising Reagent
R2-5	70ºC Operating Temperature	R2-10	70ºC Operating Temperature

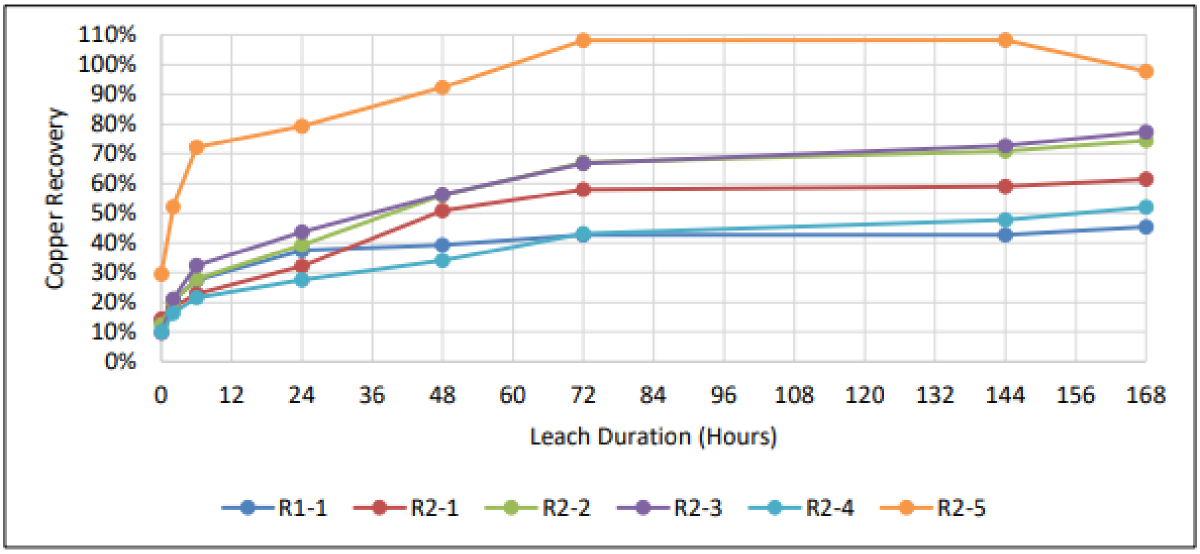

Figure 7-2 IMO High Grade Composite Leach Kinetics

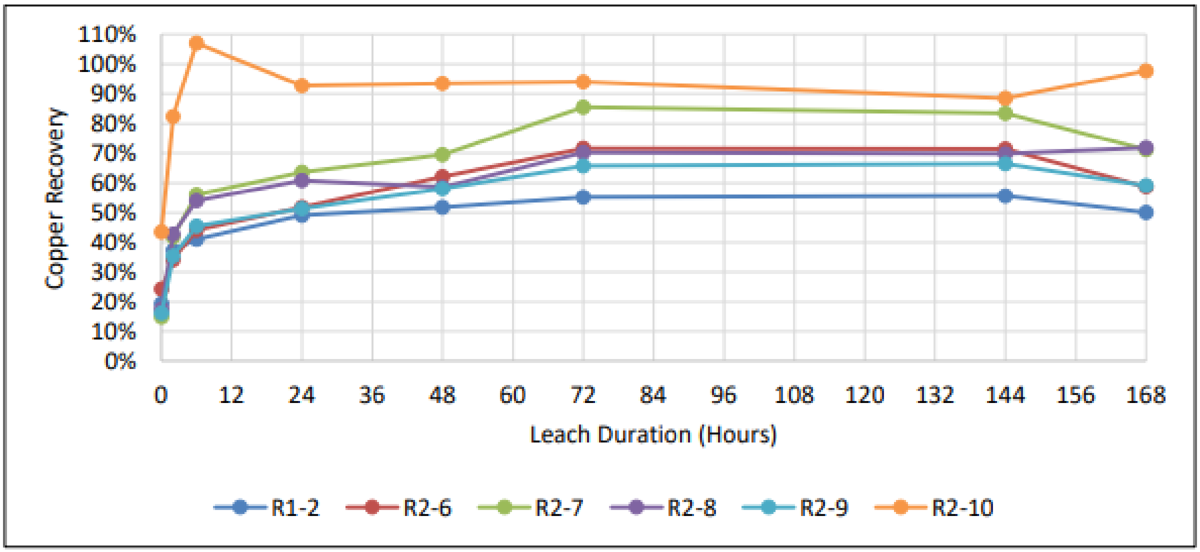

Figure 7-3 IMO Low Grade Composite Leach Kinetics

Figure 8-2 and Figure 8-3, display a variety of key trends that may prove useful to maximise copper recovery. By increasing the Eh to 450 mV the recovery of the HG composite increased from 45.4% to 61.4%, while the LG composite increased from 50.0% to 58.7%. This constituted an increase of approximately 16.1% and 8.7% for the HG and LG samples respectively. However, the highest copper leach recoveries were obtained when increasing the temperature of the system whilst targeting an increase in Eh to 450 mV. Both the HG and LG composites reached a recovery of 97.8% when increasing the temperature to 70^{o}C. This typifies the endothermic nature of the system and verifies the results.

These results indicate that not only is temperature important but the inclusion of ferric sulphate, and the amount of the reagent is very important for leach recoveries. The impact of oxygen on the system is also extremely important as well as the role of bacteria in improving leaching kinetics and recoveries.

Both the chloride concentration tests resulted in increased copper leaching. The 100 g/L chloride tests had a higher increase in copper recovery than the 20 g/L chloride tests. When using 100 g/L of chloride, the HG recovery reached 77.4% and the LG recovery increased to 71.2%. Literature reports an increase in copper recoveries with the addition of the chloride ions. The second stage of chalcocite leaching is assisted by the presence of chloride as the sulphur passivation layer is made more porous and thereby improves leaching of the covellite (CuS).

Although not indicated in the recovery graphs, it is important to note that the inclusion of chloride ions in the system induced silver leaching as well. At 100 g/L the silver recoveries were 43.5% (HG) and 80.5% (LG). Depending on mineralogy it may be possible to leach the silver from the orebody.

Although the recoveries during the IMO testwork reached a maximum of 97.8% it is likely that true values for copper recovery are much lower. ISR typically has lower recovery values than traditional agitated or heap leaching, especially when compared to the laboratory data collected through IBR. This data, however, is still important. It assesses the leachability of the ore and provides preliminary baseline information and trends that assists in making informed decisions in planning future testwork and process development that will aid the development of the ISR project.

7.2 METS Testwork

METS bottle roll leach tests conducted as a part of the long-term In-situ Copper Recovery (ISCR) study with the objective of these tests to validate historical leach testwork and optimise the leaching conditions for the long term ISCR tests involving leach boxes and packed column tests. Refer to Appendix L for the full progress report.

A total of 30 samples from different intervals were collected from drill holes. Of these, five samples were selected for head assay, mineralogical analysis and for bottle roll leach tests. The remaining samples were reserved for the ISCR tests.

The five samples tested are presented in Table 7-1 below. Sample N2126 was excluded from bottle roll testing due to insufficient mass.

Table 7-1 Sample Identification for Testing

Sample ID	Drill Hole
KML3131	NCP08
KML4330	NCP20A
KML2895	NCP45
KML2059	NCP33
N2126	NCP07

Previous leach testwork has been conducted on similar composite samples to evaluate potential copper recoveries using sulphuric acid leaching. Due to the presence of copper bearing sulphide minerals such as chalcocite within the mineralisation, ferric sulphate was introduced into the leach conditions, aiming to oxidise these minerals and enhance copper extraction.

The bottle roll tests in this program were performed under the following conditions –

- Feed make-up: 500 g of dry solids made up to 20% solids using Perth tap water (PTW).
- pH Control: The pH was adjusted to 1.0 using concentrated sulphuric acid (H_2SO_4).
- Eh Control: An oxidation-reduction potential (ORP) >550 mV was targeted, controlled using ferric sulphate ($Fe_2(SO_4)_3$) and hydrogen peroxide (H_2O_2).
- Temperature: The tests were conducted at ambient temperature.

Chloride Test:

- KML3131 (with chloride) was selected for a chloride-enhanced leach condition to compare its leaching behaviour with the non-chloride test.
- In addition to the above conditions, 50.0 g/L of chloride was added to the leach solution.

- The rest of the parameters, including pH (1.0) and Eh (550 mV), were kept consistent with the non-chloride test.

The results from the bottle roll tests are presented in Table 7-2, Figure 7-4 and Figure 7-5.

Table 7-2 % Extraction Final Solution Metal vs Calc. Head

	% Extraction							
Sample/Metal	**Ag**	**Al**	**Ca**	**Co**	**Cu**	**Fe**	**Mg**	**Ni**
KML3131 *	53.10	1.23	77.38	0.22	71.66	<0.1	2.33	9.11
KML3131	4.76	1.11	84.14	<0.1	64.70	1.99	<0.1	1.41
KML4330	-	1.50	95.25	<0.1	85.19	7.28	<0.1	1.88
KML2059	-	3.07	87.52	<0.1	90.65	<0.1	<0.1	2.86
KML2895	-	1.14	47.02	<0.1	61.38	5.93	<0.1	<0.1

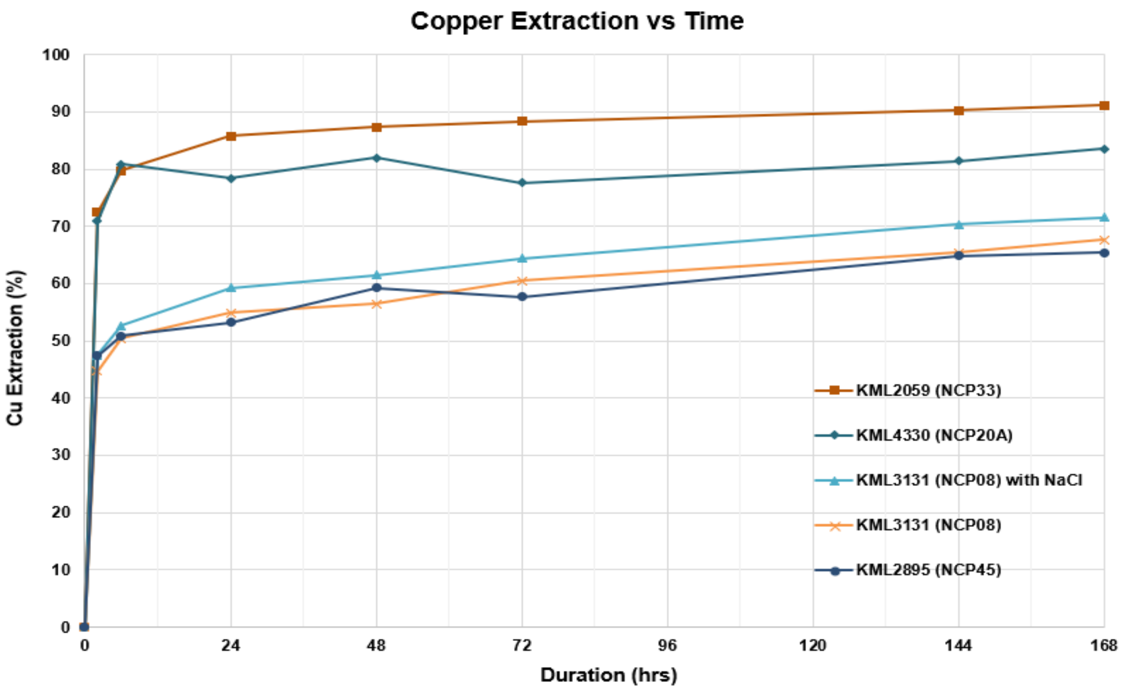

Figure 7-4 Copper Extraction vs Time

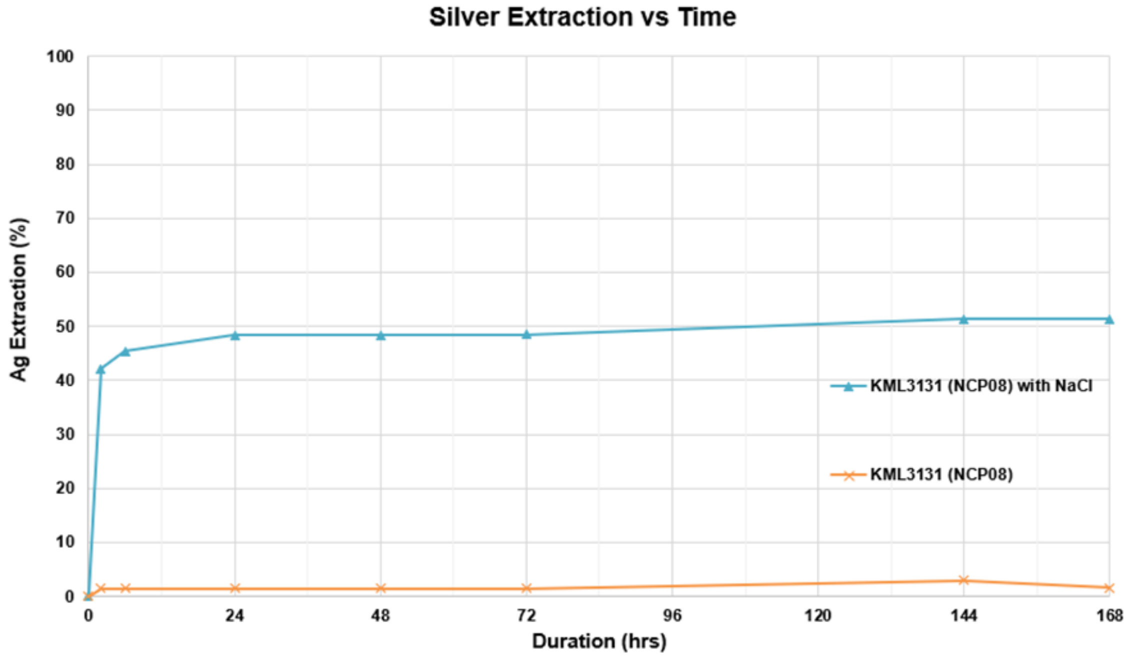

Figure 7-5 Silver Extraction vs Time

The bottle roll leach tests conducted as part of the In-situ Copper Recovery (ISCR) study provided critical insights into the leaching behaviour of five samples from different drill holes. KML2059 achieved the highest copper extraction (90.7%) with minimal reagent consumption, indicating its leachability and potential for the ISCR process. KML4330 also performed well, achieving 85.19% copper extraction with low reagent usage. The higher recoveries of these samples are related to their mineralogy and the likely presence of copper oxide minerals.

Sample, KML3131 required chloride addition to enhance silver extraction and achieve moderate copper recovery (71.7%). The non-chloride version of KML3131 performed less effectively, showing slower copper kinetics and negligible silver recovery.

These results indicate that reagent consumption can be optimised depending on the ore's mineralogy, particularly when considering the use of NaCl to boost silver recovery and improve chalcocite leaching. Samples like KML4330 and KML2059 suggest that efficient copper extraction can be achieved without additional oxidising agents, making them ideal candidates for future ISCR optimisation.

The next step in this study should focus on long-term leaching tests to confirm the initial findings from the bottle roll tests. Specifically:

- Leach Box tests will simulate in-situ leaching to assess fluid flow, metal recovery, and reagent consumption, providing long-term leaching kinetics and helping to optimise conditions for future leach box tests on drill hole samples, wellfield samples, and pilot scale operations before full scale operations.
- KML2059 and KML4330, which showed high copper recoveries with low reagent consumption, are strong candidates for further evaluation in larger column or field tests.

- For samples like KML2895, where recovery was slower, further investigation into alternative oxidising agents or extended leach times may improve performance.
- Further investigation of the use of NaCl to leach silver from the core samples and examination of the benefits of the chloride ion in increasing the recovery of copper from the chalcocite ore.
- An understanding of the mineralogy of all samples will also allow the optimisation of leaching parameters and aid recovery of target metals.

The results from the ISCR leach tests will be used to aid the modelling of copper recovery along with establishing a testwork regime that can be used in-country by Cobre Ltd to establish a leaching profile linked to their exploration drill holes and geochemistry possibly including establishing associations and links to the fracture (zones) model developed by the Litholens A1 programme. All of which will aid in the prediction of recoveries and aid wellfield design.

8. INSITU RECOVERY

In-situ recovery (ISR) also referred to as solution mining, is generally a process used to recover minerals through boreholes drilled into an ore deposit, in-situ. Target minerals are artificially dissolved from their natural solid state using a leaching solution. An ISR operation consists of a wellfield with associated infrastructure to pump and extract lixiviant (alkaline or acidic solution) in and out of the mineralised zone; and a processing facility to extract the desired mineral from the lixiviant to produce the desired final product. The process is cost effective with a small environmental impact due to the lack of excavation, mine development, waste piles, milling or smelting.

8.1 Process Description

Injection wells and recovery wells will be drilled within the vicinity of the copper mineral ore deposits at NCP according to geological surveys, hydrological studies, and initial metallurgical tests preparing the area for in-situ leaching. An acidic leaching agent added from the injection wells will travel through naturally occurring fractures within the orebody extracting the copper. Copper rich solution will be pumped to the surface through recovery wells.

Figure 8-1 show an illustration of in-situ leaching.

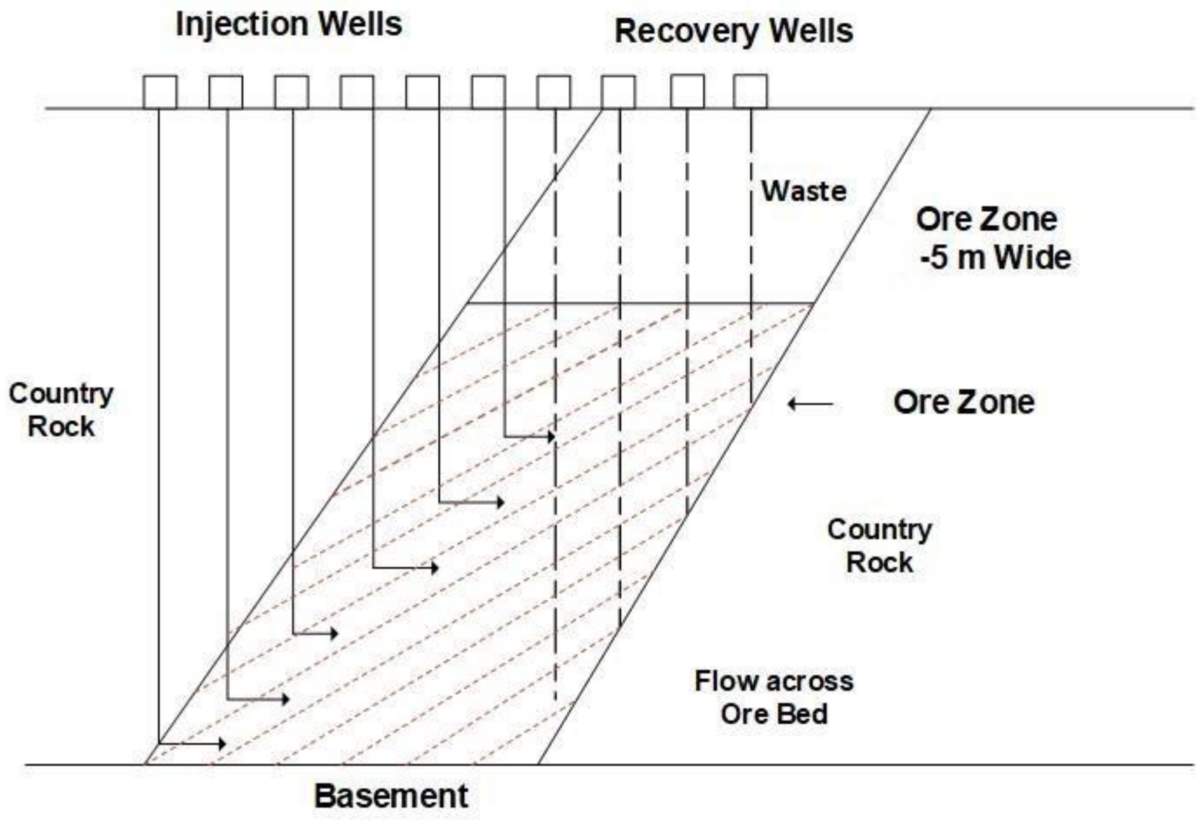

Figure 8-1 Cross Section of Injection and Recovery Wells in the ISCR Field

There are factors that generally affect the efficiency and feasibility of in-situ recovery. The main ones include:

- Permeability (hydraulic conductivity) and porosity (capacity to hold water) of both the host rock, overburden, and base layer.
- Geology and mineralogy features of the ore body and overburden including rock fractures and structures.
- Hydrology (i.e. location of groundwater table, direction of groundwater flows, rate of groundwater flow etc.)
- Type of topsoil material

The NCP area has characteristics that make in-situ recovery feasible for the copper extraction. These are:

- It has mineralisation suitable for acid leaching which has been metallurgically proven. The orebody contains fine grained chalcocite which is ideal for hydrometallurgical processes.
- The ore body contains fractures and cleavages which enhance fluid movement for leaching. The interconnected fracture orientation facilitates fluid flow parallel to and along the mineralised contact zone.
- Most of the ore body is below the water table. The water table is 130 m -140 m below the surface.
- It has competent footwall and hanging-wall rocks which provide lateral seals

8.1.1 Wellfield Arrangement

In ISR wellfields, several configuration options can optimise the extraction process based on geological and operational factors. A line drive pattern involves arranging wells in parallel lines with alternating rows of injection and recovery wells. Due to the narrow nature of the ore body a single line will be utilised, and alternating injection and production wells will be used along strike as shown in Figure 8-2,. This configuration effectively enhances leaching efficiency and metal recovery by ensuring uniform distribution of the leaching solution across the ore body. The line drive pattern is particularly suited to the project, given the structurally controlled high-grade intersections observed, optimising the recovery of both copper and silver. This scalable design ensures uniform distribution of the leaching solution and maximizes contact with the ore body, enhancing overall recovery rates.

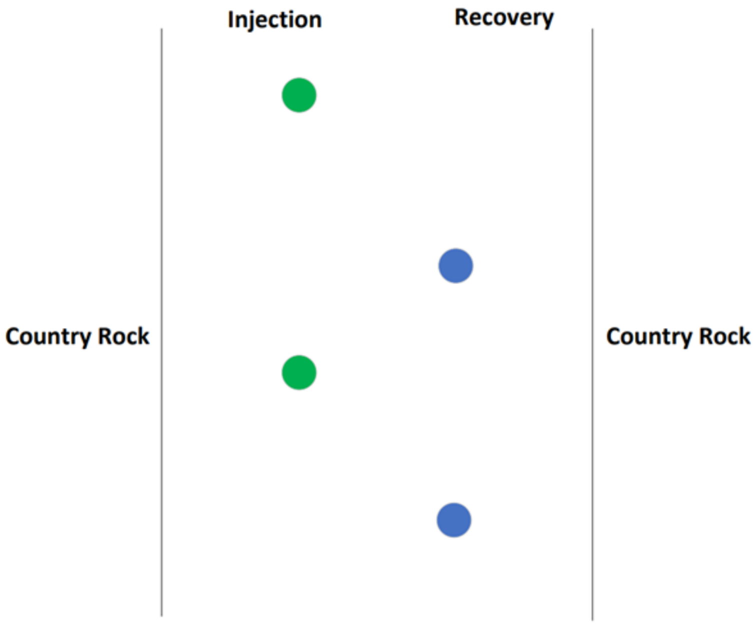

Figure 8-2: ISR Wellfields configuration

As shown in Figure 8-3 the mineralisation zone is narrow ~ 5 m wide and runs for a significant distance. To effectively access the mineralisation a line drive pattern will be utilised in the wellfield design. This will allow the greatest access to this narrow ore body and maximise the wellfield infrastructure.

Injection testing performed in May 2024 performed by WSP evaluated a range of injection rates for 24 hours. By monitoring the groundwater level in monitoring wells at different distances from the injection wells a constant injection rate of 3 L/s for 24 hours was observed. This is positive for the implementation of an ISR in this ore body.

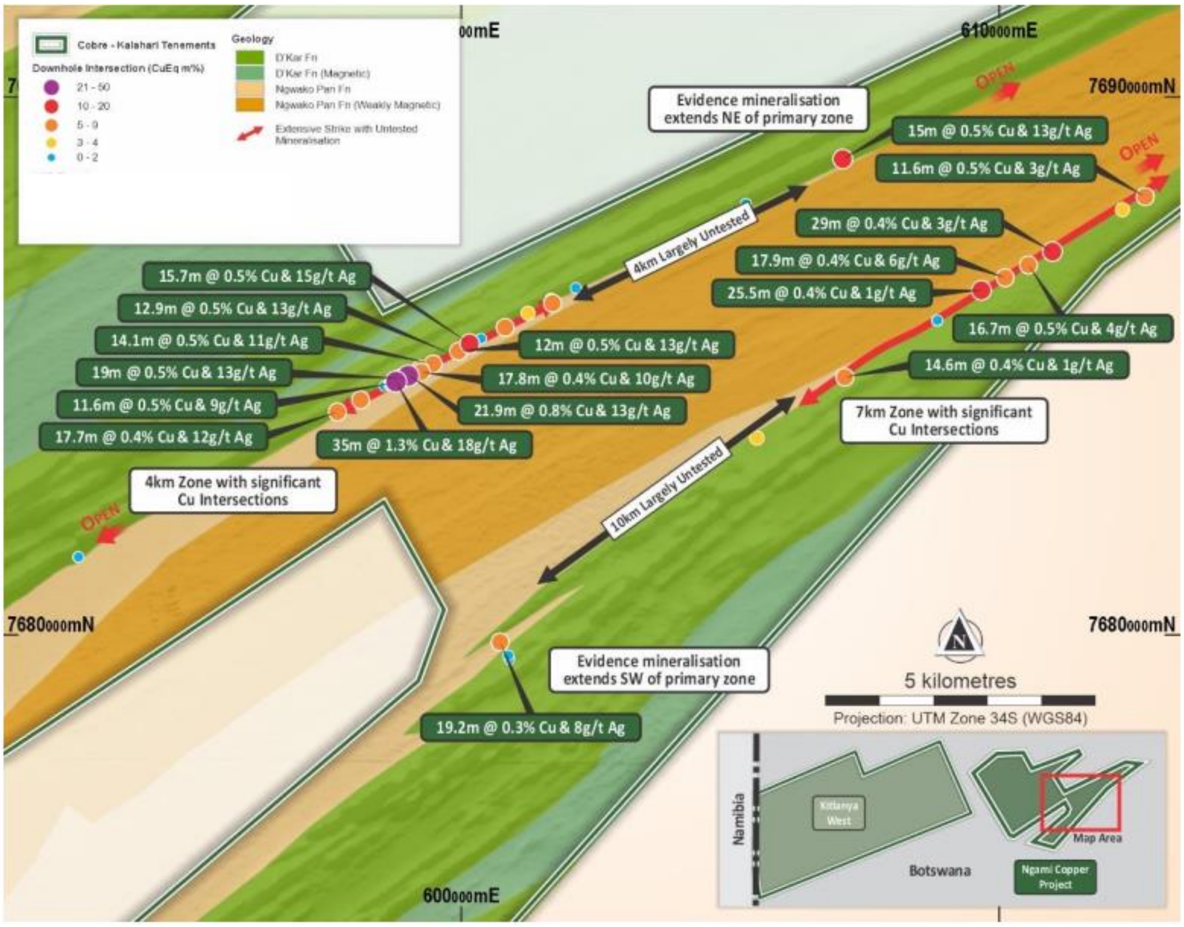

Figure 8-3 Locality map illustrating the position of the test study

8.1.2 Wellfield Operation

The solution is injected directly into the ore deposit via injection wells during the first injection cycle. A surface-mounted positive displacement pump will pump the leaching solution down the injection wells.

In-situ leaching for copper extraction involves the preparation of a leaching solution primarily consisting of sulphuric acid. Sulphuric acid serves as the main agent to solubilise copper minerals from the ore deposit. The solution is injected directly into the ore deposit via injection wells mention above.

As the leaching solution infiltrates the ore deposit, it interacts with copper-bearing minerals, chalcocite (Cu_2S), chemical reactions dissolve the copper into solution. The primary reaction of importance is the dissolution of the copper sulphide mineral by sulphuric acid, forming soluble copper sulphate complexes.

$$Cu_2S_{(s)} + O_{2(g)} + 2H_2SO_{4(aq)} \rightarrow 2CuSO_{4(aq)} + 2H_2O_{(l)} + S_{(l)}$$

Oxygen may be introduced into the solution by bubbling air through the solution using an air pump. Oxygen can enhance the leaching process by oxidising copper sulphide minerals, making them more susceptible to dissolution.

The leaching process starts with the spent raffinate. Once leaching is under way, the acid strength is increased by adding fresh acid to the barren raffinate. The cycle time for this process will be developed during the pilot trial. Based on the test work, ferric sulphate will be added to maintain an oxidation-reduction potential (ORP), which is crucial for optimising the leaching process.

$$\mathrm{Cu_2}S + Fe_2(\mathrm{SO_4})_3 \rightarrow \mathrm{CuS} + \mathrm{CuSO}_{4(aq)} + \mathrm{FeS}O_4$$

During the process, impurities in the ore, such as zinc and nickel, must be controlled to prevent contaminant build up in the raffinate. Once the copper is dissolved into the solution, the pregnant leach solution (PLS) containing dissolved copper migrates towards strategically placed recovery wells. Submersible pumps maybe employed to transfer the PLS from the recovery wells to storage tanks for further processing. This injection and extraction process is repeated as necessary across the orebody to ensure comprehensive coverage for copper extraction.

8.1.3 Wellfield Rinsing and Closure

The rinsing process after copper extraction involves three stages:

Early Rinse: This stage involves flushing and diluting the remaining pregnant leach solution (PLS) within the formation. Injection of the leaching solution continues until the copper concentration in the recovered solution drops below 0.1 g/l.

Rest Period: After the early rinse, the wellfield is closed to allow for a rest period. During this time, the formation's natural neutralisation capacity counteracts the acidity in the diluted solution.

Late Rinse: The final stage involves flushing out the neutralised solution until all regulated constituents meet specified concentrations. If necessary, a second cycle of injection will be conducted to further dilute and rinse any remaining solution, followed by another rest period if required.

Once the closure criteria for the wellfield are met, the injection and recovery wells are abandoned through grout injection from the bottom. This systematic process ensures comprehensive recovery of process solutions, restoration of water quality, and facilitates the decommissioning of the wellfield. Commonly referred to as well remediation.

8.1.4 Wellfield Staging and Development

The wellfield will be staged developed. This will allow for the project to commence with a small initial capital and resource to put under leach. As the resource grows down strike the strategic placement of subsequent wellfields can be brought online to maintain copper production.

The wellfield has been modelled as such to allow for staged development along the strike and to feed a constant PLS grade to a suitably sized solvent extraction and electrowinning plant. A block approach has been taken to feeding the process plant. Each wellfield block has the following design for duplication along strike as summarised in Table 8-1.The number of wellfields and total strike will increase once stage 2 of the project begins, and the demand for copper rich solution increases.

Table 8-1 Well Field Design Criteria

Description	Stage 1 – Starter Plant	Stage 2 – Full Production	Units
Wellfield Length along strike	500	10500	m
Well Spacing	100	100	m
Number of Wells	5	105	-
Production/ Injection Wells	Dual purpose	Dual purpose	
Well Arrangement	Line Drive	Line Drive	-
Drill Depth	260	260	m
Flowrate per well	3	3	L/s
Maximum Wellfield PLS Flowrate	54	1135	m^3/h

8.2 Alternate Technologies

Several technologies and opportunities exist that could be implemented in the in-situ copper recovery process to further improve recoveries and operability of the well field operation. These technologies include:

- Directional Drilling
- Fracking
- Specialised Blasting
- Isokinetic

8.2.1 Directional Drilling

Due to the nature of the mineralisation, the geological structure of the orebody, the width, and the overburden the in situ leaching well field is a prime candidate for directional drilling.

Directional drilling has a long history in the oil and gas industry and is increasingly being used in the mining arena due to technological advances that have made the steering tools more feasible for drilling equipment. This technique overcomes the challenges of reaching a target zone such as a geological feature that is inaccessible via vertical drilling, including drilling into a deep mineral zone covered by rock that would make drilling multiple surface holes difficult and possibly dangerous. This type of drilling involves drilling wells at multiple angles rather than just vertically, it enables the drill to be directed to a specific coordinate.

For an orebody such as Cobre's, with a large overburden of material and narrow width (currently 5 m) directional drilling would be advantageous. The use of "standard" drill rigs and Devico's DeviDrill™ steerable wireline core barrels which can create multiple branches from a single pilot hole thereby dramatically reducing time spent and cost of drilling due to lower meterage may be beneficial to the operation. Whether this has applications for extraction and injection wells for an ISR project is yet to be determined but should be investigated as an opportunity.

Directional drilling enhances ore access, maximising the contact between the leaching solution and the ore. This type of drilling allows for the precise placement of injection and recovery wells, improving leaching efficiency and recovery rates. By reducing the number of necessary surface wells, this technique also minimises surface disturbance and significantly reduces the environmental footprint.

In ISR operations direction drilling opens new possibilities for mining in environmentally sensitive or densely populated areas where traditional mining methods would be disruptive. It allows for the exploitation of ore bodies located beneath infrastructure or natural features that would otherwise be inaccessible. This technique can also facilitate the development of complex well patterns tailored to the specific geometry of the ore deposit, further enhancing recovery efficiency. Economically, directional drilling reduces the need for extensive surface infrastructure, as more holes can be drilled with less changes in position of the drill rig lowering capital and operational costs, minimising surface disturbance, potentially reducing regulatory and land reclamation expenses. Additionally, the ability to steer the drill bit with precision means that directional drilling can avoid geological obstacles (e.g. aquifers), reduce drilling risks, and optimise the economic return for the mining operation.

Overall, the integration of directional drilling into ISR projects represents a significant advancement in mining technology, providing opportunities for more effective, responsible, and economically viable resource extraction.

8.2.2 Fracking

Fracking is a proven technology used for extracting oil, natural gas, geothermal energy, or water from deep underground reservoirs. It works by injecting high-pressure fluids into rock formations, creating fractures that improve permeability and help fluids flow into surrounding rock and to extraction wells. While fracking is widely used for these purposes, it is not commonly employed for in-situ recovery (ISR) of minerals like copper or uranium. However, when fracking is used in ISR, it can enhance permeability in the ore body, allowing the leaching solution to flow more effectively through the rock, which can increase the efficiency of mineral extraction and potentially improve recovery time. Additionally, fracking can make ISR efficient in formations with low natural permeability by creating pathways for the leaching solution to reach the minerals.

Despite these advantages, ISR operations prioritise environmental stewardship and minimising surface disruption. Fracking, with its potential to create unintended pathways for leaching solutions into surrounding formations or aquifers, raises significant environmental concerns. Controlling the migration of fluids and chemicals in underground environments can be complex and may pose risks to groundwater quality and ecosystem integrity, which are critical considerations in ISR projects. The creation of fractures can lead to potential contamination of surrounding groundwater if the leaching solutions migrate beyond the targeted area.

Economically, ISR projects are driven by the efficiency of mineral extraction and operational costs. The additional expenses and technical complexities associated with fracking may not justify the potential benefits in ISR contexts. Alternative methods, such as optimising leaching solution chemistry or utilising directional drilling, can achieve comparable or superior results more cost-effectively.

Experts suggest that this deposit is too shallow and near surface for fracking to be a feasible option.

8.2.3 Soundless Cracking Demolition Agents

Due to the incompatibility of hydraulic fracturing to associated environmental impacts and potential uncontrolled fracture propagation an alternative method using Soundless Cracking Demolition Agents (SCDA's) to produce controlled fractures in a rock mass has been studied for application to ISR.

SCDA is a cementitious expansive agent when mixed with water and injected into a mineral bearing rock it fractures the surrounding rock by an expansive pressure generated from hydration The expansive pressure is caused by the volumetric expansion of the agent with rate controlled by other cementing compounds such as Alite. This prevents rapid and uncontrolled fracture nucleation and propagation from the borehole typically seen in hydraulic fracturing caused by sudden strain energy release of the rock mass.

These chemicals are not new, they were introduced in the 1970's for the safe demolition of concrete structures and have been used for the surface quarrying of dry hard rocks such as granite under zero in-situ stress.

To date not much research has been carried out to evaluate the performance of SCDA. It is perceived that fracturing using SCDA will produce radial fractures surrounding an injection well and the length of the fracture is controlled by the amount of product used. The development of hydrophobic SCDA's with rapid expansive pressure may be useful in ISR applications to improve the efficiency of ISR. However, studies need to occur to better understand the mechanics of rock fracturing using SCDA under in-situ stress conditions and to assess the fracture performance of the SCDA including the consequences in ISR applications.

8.2.4 Blasting

Blasting involves the controlled use of explosives to create fractures and increase rock permeability. This method allows leaching solutions to penetrate more deeply and uniformly, improving mineral dissolution and recovery rates. By strategically placing blast holes and timing detonations, operators can optimise fragmentation and minimise damage to surrounding structures. The increased surface area from blasting ensures better contact between the leaching solution and the minerals, preventing solution channelling and accelerating the chemical reactions needed for efficient mineral extraction.

Blasting offers significant opportunities by enhancing the effectiveness of in-situ leaching. It is adaptable to various mining scenarios, making it suitable for different ore body depths and types. The method's ability to accelerate the leaching process can lead to faster recovery rates, improving overall operational efficiency and cost-effectiveness by reducing the need for extensive drilling. However, while blasting can significantly improve the efficiency of in-situ leaching, it also poses environmental risks. Uncontrolled blasting can lead to unintended fractures and overbreak, potentially allowing leaching solutions to escape the target area and contaminate surrounding groundwater and ecosystems.

Currently this strategy will have limited effect as there is a lack of voidance for the expansion of rock and most of the fracturing will be localised around the well and drill holes. Leading to minimal benefit throughout the ore body.

8.2.5 Electrokinetic (EK-ISR)

Electrokinetic In Situ Recovery (EK-ISR) is an innovative mining technology designed to extract metals from ore deposits without the need for traditional excavation or fracking methods. This method leverages an applied electric field to stimulate the transport of ions within the ore body, making it a more environmentally friendly and efficient alternative to conventional mining techniques. By using electrodes of opposite polarity (anodes and cathodes) placed in boreholes drilled into the ore body, EK-ISR facilitates a process known as electromigration. In this process, specific ions, known as leaching agents, are mobilised across the ore. These ions interact with the minerals in the ore, dissolving the targeted metals and forming charged complexes that migrate towards the opposite electrode for recovery.

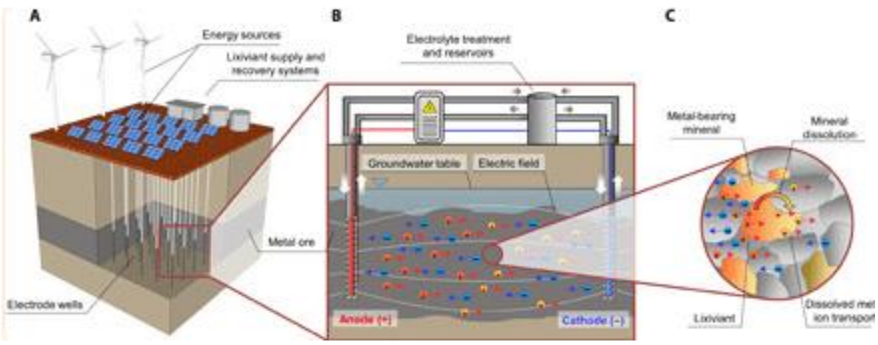

Figure 8-4 Metal Extraction from a Subsurface Orebody via EK-ISCR (Source Martens)

Traditional injection and extraction wells are modified to contain either the anode or the cathode along with appropriate process control. The target metals (cations are extracted from the well containing the cathode electrode. Systems are needed at the reservoirs for buffering of solutions.

One of the primary advantages of EK-ISR is its minimal environmental impact. Unlike traditional mining methods, EK-ISR like ISR does not produce waste rock, tailings, dust, or noise. The process requires only minimal physical disruption, such as drilling boreholes for electrode placement, making it significantly less invasive than conventional mining. The process is also applicable for a broader range of leachable minerals and deposits worldwide including rare earth elements, vanadium, gallium and lithium to name a few. Additionally, EK-ISR poses a lower risk to environmental receptors, including groundwater and surface water bodies, particularly when targeting low-permeability ore bodies. This makes EK-ISR a safer option for extracting metals in sensitive environments.

While Electrokinetic in Situ Recovery (EK-ISR) offers significant environmental benefits and efficiency for metal extraction, it comes with several challenges and disadvantages. It is most suitable for orebodies below the groundwater table as electromigration rapidly becomes inefficient with declining water saturation. The high initial costs for setting up the specialised equipment and infrastructure including larger diameter and number of drill holes, closer spacing of the field pattern (<5m based on modelling data) along with the energy-intensive nature of operating the electric field, can lead to substantial operational expenses. Maintenance cost of wells due to the electrode system involved in EK-ISR would be higher than ISCR extraction and injection wells the technical complexity of controlling and monitoring various parameters requires specialised expertise and equipment, and unintended electrochemical reactions may complicate metal recovery. Additionally, EK-ISR may not be suitable for all types of ore bodies or mineral deposits, as its effectiveness depends on specific geological and chemical site properties, limiting its applicability.

9. PROCESSING

Ore from the proposed Ngami Copper Project (NCP) will undergo in-situ recovery. The loaded solution from the wellfield after recovery is transferred to the processing plant for downstream processes with the aim of producing LME copper cathodes, silver metal and copper sulphate. The processing section aims to outline and explain the process deliverables which are packaged in Appendices. These include:

- Process Flowsheets
- Process Description
- Process Design Criteria
- Mass Balance
- Mechanical Equipment List

9.1 Process Flow Diagrams

METS developed process diagrams for the proposed plant. These flowsheets can be viewed in Appendix A. From these flowsheets METS developed a process description which can be read in conjunction with the flowsheets. The full process description can be found in Appendix B. The flowsheets are numbered based on the work breakdown structure, and it comprises of 6 areas, outlined in Table 9-1.

Table 9-1 Area Descriptions

Area	Description	Category
100	In-situ Recovery (ISR) Wellfield	Extraction
200	Tank Farm	Storage and Distribution
200	Pond Farm	Storage and Distribution
200	Reagents	Storage and Distribution
300	Silver Precipitation	Process Plant
300	Silver Production	Process Plant
400	Solvent Extraction	Process Plant
500	Electrowinning	Process Plant

500	Copper Sulphate Crystallisation	Process Plant
600	Site Services	Power
600	Site Services	Diesel
600	Site services	Water
600	Site Services	Air

Area 100 comprises of the ISCR wellfields where copper and silver extraction occur producing a pregnant leached solution.

Area 200 is the Tank, Pond and Reagents farm. All the reagents will be stored and diluted in this area.

Area 300, 400, and 500 are the process plant areas where processing of the pregnant leach solution will occur to form solid LME copper, copper sulphate and silver.

Area 600 is a service area which includes water, air, fuel and power services.

The overall process is summarised in Figure 9-1.

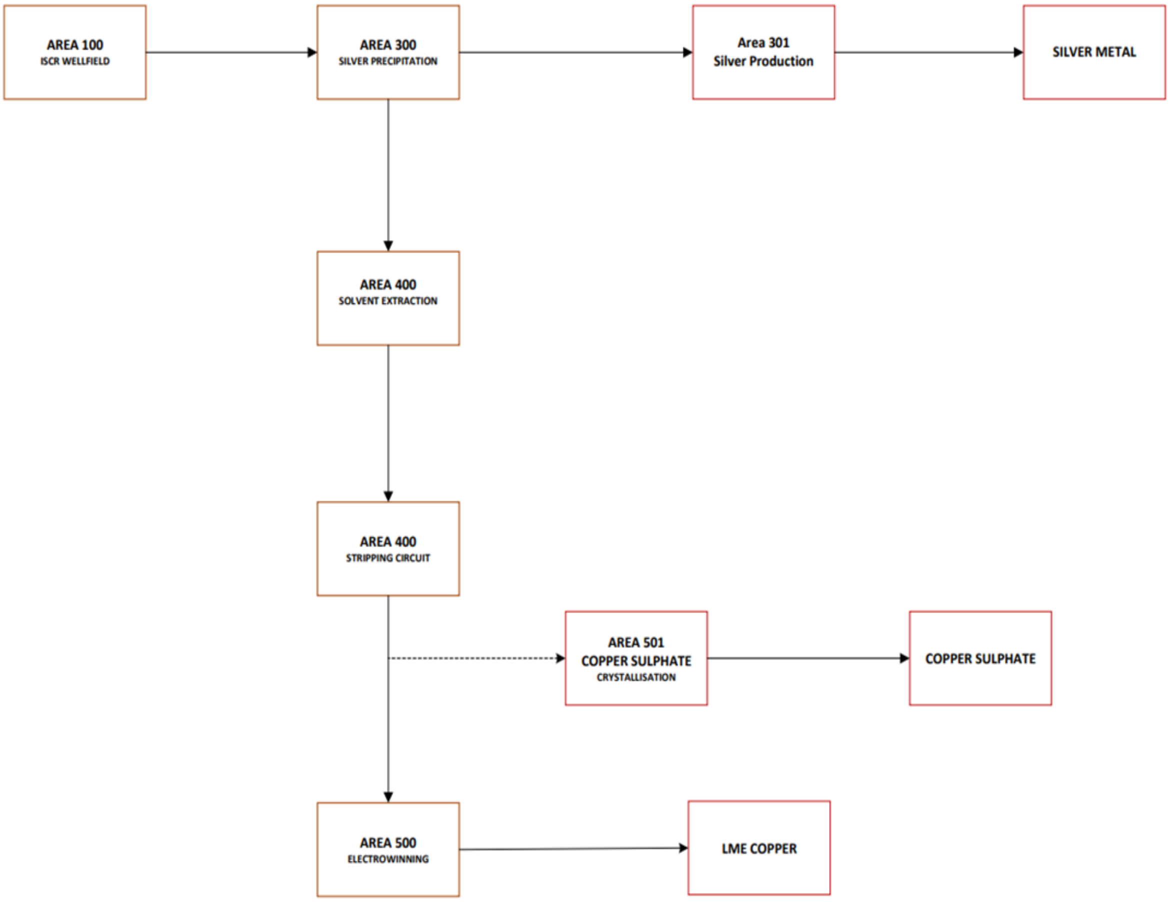

Figure 9-1 Process Overview

9.2 Process Description

9.2.1 Copper Extraction

In-situ copper recovery involves the preparation and injection of a leaching solution into the wellfield for copper extraction. The primary reagent used in the leaching solution for this project is sulphuric acid. The acid is combined with ferric sulphate and raffinate solution to make the leaching solution. The solution serves to dissolve the copper bearing minerals from the ore deposit as the solution permeates the ore.

Some copper minerals, such as chrysocolla ($CuSiO_3.2H_2O$) found in the NCP ore body, are easily dissolved in dilute sulfuric acid. This is because the reaction only involves acid attack with no redox reaction and thus, no oxidant is needed:

Equation 1

$$CuSiO_3.3H_2O(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + SiO_2.H_2O(s) + 3H_2O(l)$$

Other copper minerals require an oxidant to render their component elements soluble. In these cases, extraction is only achieved by adding an oxidant, such as ferric ion, oxygen or iron/sulphur oxidising bacteria. Chalcocite (Cu_2S) is a good example of this type of copper mineral. Equation 2 shows its overall leaching reaction with oxygen as an oxidant. Oxygen is soluble in water and thus, naturally exists in aqueous solutions up to its maximum solubility. It can be enriched by aeration.

Equation 2

$$\mathrm{Cu_2S + O_2 + 2H_2SO_4 \rightarrow 2CuSO_4 + 2H_2O}$$

The presence of suitable bacteria increases chalcocite oxidation breaking down the CuS formed:

Equation 3

$$CuS + 2O_2 \rightarrow CuSO_4$$

If Fe (III) is the only oxidant, the chalcocite leaching involves two sequential redox reactions Equation 4 and Equation 5.

Equation 4

$$\mathrm{Cu_2}S + Fe_2(\mathrm{SO_4})_3 \rightarrow \mathrm{CuSO_4} + 2FeSO_4 + \mathrm{CuS}$$

Equation 5

$$\mathrm{CuS} + Fe_2(\mathrm{SO_4})_3 \rightarrow \mathrm{CuSO_4} + 2\,FeSO_4 + S$$

Equation 6 is the overall leach equation:

Equation 6

$$\mathrm{Cu_2}S + 2Fe_2(\mathrm{SO_4})_3 \rightarrow 2\mathrm{Cu}SO_4 + 4\mathrm{Fe}SO_4 + S$$

Copper is dissolved into the solution, as the solution migrates from the injection wells towards strategically placed recovery wells and is pumped to ponds and storage tanks on the surface.

This injection and extraction process is repeated as necessary across the orebody to ensure saturation and wetting of the orebody with solution to maximise copper recovery.

9.2.2 Silver Extraction

During copper extraction, initial leachability testwork suggested silver may also be recovered from the orebody by the addition of sulphuric acid, ferric sulphate in the presence of chloride ions. If the right conditions are established and maintained in the wellfield there may be an opportunity to extract silver. Consequently, the pregnant leach solution (PLS) recovered could contain the priority target copper ions and silver as a byproduct.

The exact method for silver extraction from the ore is yet to be determined and will be confirmed with additional testwork and further understanding of the mineralogy of the silver minerals and their association with the copper.

9.2.3 Silver Precipitation

Once the Pregnant Leach Solution (PLS) is collected and transferred to the Pregnant Leach Solution Tank, the subsequent stage involves silver precipitation. During this step, the PLS is mixed with sodium chloride that induces the precipitation of silver ions from the solution. The addition of the reagent in excess initiates the formation of fine silver chloride particles, which gradually settle at the bottom of the solution as a solid precipitate. The chloride ions (Cl^-) react with silver ions (Ag^+) present in the PLS, forming insoluble silver chloride (AgCl) precipitates:

Equation 7

$$Ag^+{}_{(aq)} + \mathrm{Cl}^-{}_{(aq)} \rightarrow \mathrm{Ag}Cl_{(aq)}$$

After the precipitation reaction is complete the mixture produced is then transferred to a clarifier for settling.

9.2.4 Filtration and Clarification

Sedimentation occurs in the clarifier where the supernatant solution, now depleted of silver ions, is the clarifier overflow and the underflow is a silver chloride slurry. The next step is to filter the silver chloride precipitates from the pregnant leach solution (PLS) to purify it before the copper solvent extraction stage. The silver chloride slurry mixture is pumped into the plate and frame filter which forms a AgCl filter cake as the residue. The filtrate loaded with Cu^{+2} is combined with the clarifier overflow and is passed through a sand filtration system to remove any remaining particulates before proceeding to downstream copper processes.

9.2.5 Silver Recovery

The silver chloride filter cakes are transferred using a conveyor belt system into a dryer before being smelted in a furnace at temperatures ≥ 900°C. The smelting furnace is an electric furnace where sodium carbonate is added for the silver chloride decomposition reactions and Borax flux for the removal of impurities. Borax melts and forms a glassy layer over the molten metal, protecting it from oxidation. Equation 8 and Equation 9 show the decomposition reactions.

Equation 8

$$2AgCl_{(s)} + Na_2CO_{3(s)} \rightarrow Ag_2O_{(s)} + 2NaCl_{(s)} + CO_{2(g)}$$

Equation 9

$$2Ag_2O_{(s)} + Heat \rightarrow 4Ag_{(s)} + O_{2(g)}$$

9.2.6 Solvent Extraction

Once the pregnant leach solution (PLS), depleted of silver, is collected from the filtration step the next stage of processing is solvent extraction. It is used as a concentration and purification process for the copper extracted during in-situ recovery before electrowinning. During this step, the PLS is mixed with an organic solvent in mixer-settler units, in a counterflow configuration. The organic phase consists of an extractant which enables a highly selective transfer of copper from the PLS in the aqueous phase dissolved in a diluent which acts as a carrier medium. Common extractants used in copper extraction include hydroxyoximes, such as LIX®, and ketoximes, such as Acorga®. These are often dissolved in a diluent to form an organic phase, which helps adjust the viscosity and density of the organic phase. Diluents typically include organic solvents, such as kerosene, aliphatic hydrocarbons, and aromatic hydrocarbons.

This process will involve two steps: extraction to transfer the dissolved copper from the pregnant leach solution (aqueous phase) into an organic phase and stripping to transfer the high purity copper from the organic phase back to an aqueous phase. Equation 10 shows the extraction reaction and Equation 11 shows the stripping equation.

Equation 10

$$Cu^{2+}(aq) + 2RH(org) \rightarrow R_2Cu(org) + 2H^+(aq)$$

Equation 11

$$R_2Cu(org) + 2H^+(aq) \rightarrow Cu^{2+}(aq) + 2RH(org)$$

Where:

$Cu^{2+}(aq)$ - is copper in solution (PLS)

$RH(org)$ - is the extractant i.e stripped organic

$R_2Cu(org)$ - is the copper/extractant i.e. loaded organic

$2H^+(aq)$ - is acid in raffinate solution

The solvent extraction circuit for the project consists of two extraction cells and two stripping cells. Subsequently, the mixed solutions are directed to the settler, where the organic and aqueous phases are allowed to separate. The resulting aqueous solution is directed to the raffinate pond whilst the loaded solvent from the extraction stage is then mixed with a spent electrolyte in the stripping stage. In this stage, the loaded solvent is stripped of its copper using a strongly acidic spent electrolyte solution, and then separated in the settler. Sulphuric acid is commonly used to create an acidic environment. The stripped organic solution is then recirculated back to the extraction stage to collect more copper whilst the enriched electrolyte solution is directed through an electrolyte tank and then to the electrowinning process. Some filtering and crud removal systems are used to remove any impurities from the circuit prior to electrowinning. The extraction and stripping processes are undertaken as a continuous steady state system, with PLS being fed into the extraction process at one end and a concentrated copper solution emerging at the other end ready for electrowinning.

9.2.7 Solution Tenor

Following solvent extraction, this solution will be concentrated to provide a feed with a copper tenor of 50-60 g/l for the electrowinning stage. After electrowinning, the exit solution will have a reduced copper concentration. These parameters will be refined and confirmed through test work and pilot trials to ensure optimal process efficiency and copper recovery.

9.2.8 Electrowinning

Electrowinning is the method used to extract copper metal from solution through electrolysis. The strip solution, enriched in copper ions, is feed to the Electrowinning Cells, which are electrolytic cells equipped with cathodes and anodes immersed in an electrolyte solution. The strip solution serves as the electrolyte, while the cathodes are made of stainless steel or other conductive materials. When an electric current is applied to the electrowinning cell, copper ions in the electrolyte solution are attracted to the cathode surface and deposit onto it as solid copper metal. This electrodeposition process effectively removes copper from the solution, resulting in the production of high-purity copper metal (LME grade) at the cathode. The cathodes loaded with metallic copper are washed to clean them of residues of the electrolytic solution. After washing, the support bars are removed from the cathode plates using a cathode stripping machine so that they can be reused. The stripped cathode plates of LME grade copper are then stacked to form packs while the washing water will be directed to the barren solution makeup tank. Spent electrolyte from the electrowinning cells is pumped back to the stripping circuit.

Simultaneously, the anodes in the electrowinning cell undergo oxidation, releasing electrons into the solution. This process helps maintain electrical neutrality within the cell and enables the continuous deposition of copper metal at the cathode.

The electrowinning reaction is:

Equation 12

$$\mathrm{CuSO_4} + \mathrm{H_2O} \rightarrow \mathrm{Cu} + ½\mathrm{O_2} + \mathrm{H_2SO_4}$$

The following electrode reactions take place at the cathode and anode:

Cathode (Reduction):

Equation 13

$$\mathrm{Cu^{2+}} + 2\mathrm{e^-} \rightarrow Cu_{(\mathrm{S})}$$

Anodes (Oxidation):

Equation 14

$$H_2O \rightarrow 2H^+ + {}^1/_2\, O_2 + +2e^-$$

9.2.9 Copper Sulphate Crystallisation

A portion of the strip solution, enriched in copper ions, is diverted to the Crystallisation Feed Tank proceeding to an Evaporative Crystalliser. In the crystalliser water is drawn off to leave behind a saturated copper sulphate solution with blue crystals of copper sulphate pentahydrate ($CuSO_4•5H_2O$). When a high level of saturation is achieved, the solution is sent to a centrifuge to collect the copper sulphate solids product. The mother liquor is recycled back into the stripping cell to recycle, and subsequently retain the uncrystallised copper sulphate. The solid product is sent to a flash dryer, where water is further drawn off and the product is weighed and transferred into product packaging and then into drums for shipping.

9.2.10 Leaching Solution Reconditioning

Barren solution from metal recovery circuits (solvent extraction and electrowinning) is collected for reconditioning. This process involves adjusting the acidity back to the targeted pH of 1-1.5 that is required for leaching by addition of concentrated acid. It also includes bleeding, to lower the level of ore impurities (zinc, nickel). The specific cycle times for this process will be developed during the pilot trial. Based on the test work, ferric sulphate can also be added to maintain an oxidation-reduction potential (ORP), which is crucial for optimising the leaching process.

9.3 Process Design Criteria

METS has developed Process Design Criteria which can be found in Appendix C. Separate design criteria are available for stage 1 and stage 2. The design criteria were used to develop the mass balance using the following assumptions.

Table 9-2 PDC Assumptions

Assumptions	Unit	Stage 1 – Starter Plant	Stage 2 – Full Production
Resource Under Leach	t	1,315,750	27,655,749
Silver Feed Grade	g/t	7	7
Copper Feed Grade	%	0.40	0.4
ISCR Production Well Field Operating Hours	h/a	7884	7884
ISCR Production Well Field Availability	%	90	90
Silver Precipitation Plant Operating Hours	h/a	8322	8322

Silver Precipitation Plant Availability	%	90	90
SX Plant Operating Hours	h/a	8585	8585
SX Plant Availability	%	98	98
EW Plant Operating Hours	h/a	8585	8585
EW Plant Availability	%	98	98

Table 9-3 Production Rates and Recovery

Description	Units	Stage 1	Stage 2
ISCR Production Well Field Nominal Rate	m^3/h	158	3319.6
Silver Precipitation Plant Nominal Rate	m^3/h	158	3319.6
SX Plant Nominal Rate	m^3/h	158.4	3329.0
EW Plant Nominal Rate	m^3/h	32.58	684.7
Copper Production	Mlb/a	4	88
	ktpa	1.9	40
Silver Production	t/a	1.88	39.5
Copper Recovery	% Cu	36	36
Silver Recovery	% Ag	20.4	20.4

9.4 Process Plant Reagents

Table 9-4 shows a list of the reagents used in the proposed process scheme, their use and methods of storage.

Table 9-4 Process Reagents

Reagent	Use	Storage
Diluent/Kerosene	As a carrier medium for the extractant in the organic phase	Storage tank
Extractant	Enables selectivity in the transfer of copper from the aqueous phase into the organic phase.	Isotainers

Sulphuric acid	For making the leaching agent, pH adjustment, and for stripping liquor makeup	Storage tank
Ferric sulphate	For leaching	Silo
Sodium chloride	For silver precipitation and leaching agent	Silo
Borax	As a flux in silver smelting to remove impurities	Bags
Sodium carbonate	Decomposition agent for silver production	Silo

9.5 Process Plant Utilities

Table 9-5 shows the summary for the process plant utilities for stage 1 and stage two. The total power required to operate the plant was developed from adding the power consumption for equipment from each process area. The sum diesel required to operate the plant is 3,141,601 litres per year in stage 1. The value was calculated by multiplying the power consumption from each process area with the amount of diesel required to operate it assuming that 0.3 litres of diesel is consumed per one kWh. The air, process and potable water required can be calculated at a higher stage of study when more information has been collected from suppliers and testwork.

Table 9-5 Process Plant Utilities Summary

Utility	Unit	Stage 1	Stage 2
Diesel	L/a	3,141,601	TBD
Potable water	kL/day	TBD	TBD
Process water	kL/day	TBD	TBD
Raw water (dust suppression)	kL/day	TBD	TBD
Power	kWh/a	10,472,005	124,005,102
Air	Atm	TBD	TBD

9.6 Mass Balance

The proposed ISCR, Silver Precipitation and Solvent Extraction/Electrowinning process for the NCP was modelled and simulated using SysCAD. SysCAD is provided by KWA Kenwalt Australia. SysCAD is a powerful and versatile plant simulation software and can be used to simulate the simplest processing circuit through to a complex full plant operation. SysCAD can serve every aspect of the plant life cycle from the feasibility study stage through the design and commissioning stages into the operations and maintenance to expansion and beyond.

The main goal of the simulation was to determine the stream flowrates for equipment sizing of the circuits.

The SysCAD model simulate the process flowsheet for the major process areas:

- ISCR Wellfield
- Silver Recovery Circuit
- Solvent Extraction
- Electrowinning

The SysCAD flowsheet is shown in Figure 9-2. The SysCAD flowsheet is a simplified simulation model of the process flowsheet.

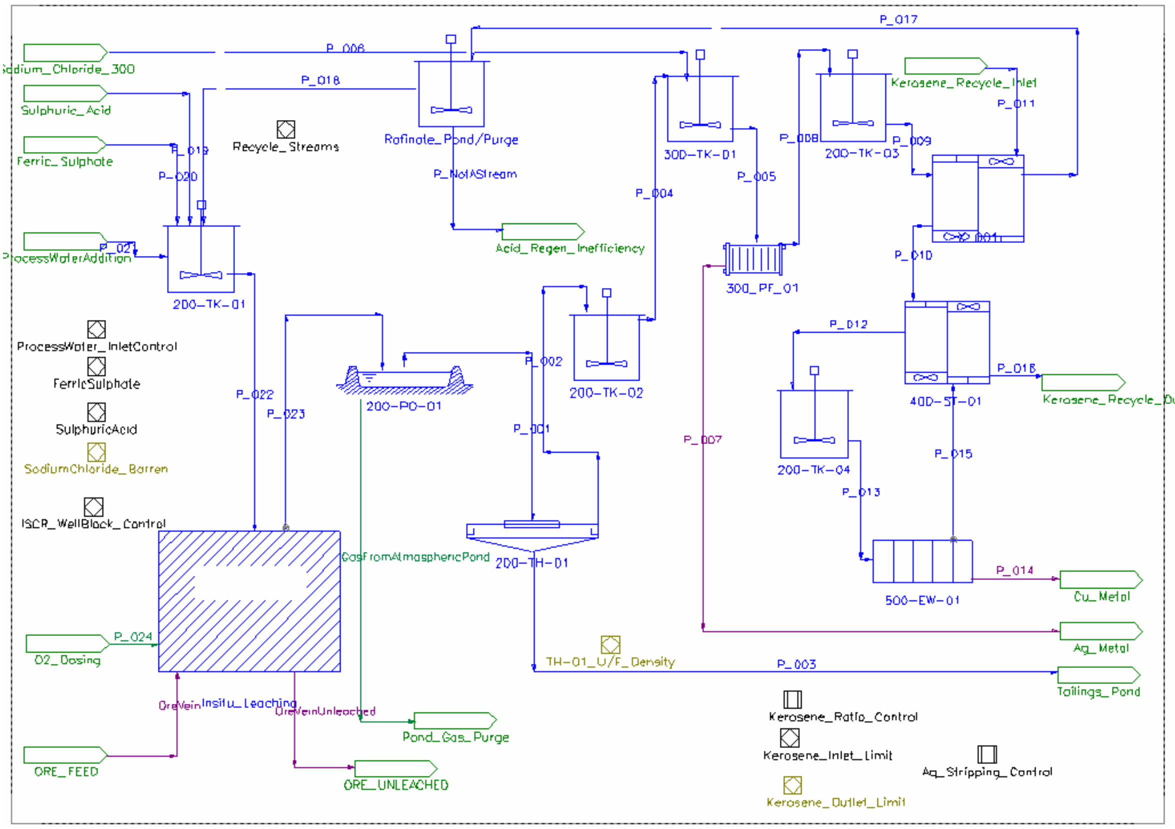

Figure 9-2 SysCAD Flowsheet

Raffinate is pumped into the ISCR wellfield, where leaching of the ore body occurs. The solution is pumped from the wellfield with an increased copper tenor. This copper pregnant solution or PLS is pumped to the processing plant. The solution passes through a thickener to remove solids from the slurry. The overflow from the thickener then feeds the silver precipitation process. Sodium Chlorine is added to the process to induce silver chloride forming, a solid material. The solid silver chloride is removed from the rest of the process stream through a filter. Conservative estimates for silver leaching have been used.

The rest of the solution is sent to solvent extraction to concentrate and collect the copper in the stream. The extraction O:A ratio is 1:1 while the stripping O:A ratio is 1:5. These O:A ratios have been utilised for mass balance purposes and will be confirmed by metallurgical testwork at a later stage. Through this process the concentration in the stripping aqueous solution builds up over multiple stages The copper leaving the stripping circuit is sent to electrowinning. The copper is removed from solution to create copper metal which is exported from the site. The copper in the aqueous solution leaving the electrowinning cell is sent back around to rebuild the appropriate level of copper concentration.

Table 9-6 provides a list of inputs used to develop the mass balance, while Table 9-7 provides the outputs used from the SYSCAD model. The model was used primarily to determine reagent consumptions and the production rate of copper & silver. The process is split into two stages. With stage 1 being a much smaller process, while stage 2 occurs from year four onward and is the expanded process plant.

Table 9-6 Inputs for SYSCAD Model

Stream	Variable	Unit	Value Type	Input
P_023	Copper Concentration	g/L	Set Point	1.58
P_011	Kerosene Flowrate	m^3/h	Set Point	1:1 P_009
200_TH_01	Solids in U/F	%	Absolute Value	100
P_018	Acid Loss	%	Absolute Value	25
P_018	Water Loss	%	Absolute Value	16
500_EW_01	Electrowinning Efficiency	%	Absolute Value	25
In-situ_Leaching	Copper Extent of Reaction	%	Set Point	40
In-situ_Leaching	Silver Extent of Reaction	%	Set Point	20

Table 9-7 Outputs from SYSCAD Model

Stream	Variable	Unit	Value Type	Stage 1	Stage 2
P_021	Process Water	t/h	Consumption	24.89	523.2
P_020	Ferric Sulfate	t/h	Consumption	0.27	5.7
P_019	Sulfuric Acid	t/h	Consumption	0.21	4.3
P_006	Sodium Chloride	t/h	Consumption	0.20	4.2
P_007	Silver Chloride	g/h	Production	215.04	3402
P_014	Copper Metal	kg/h	Production	246.00	5171

9.6.1 Assumptions

- Water losses are to evaporation and voids in the ISCR

- Sulphuric acid losses are to solvent extraction acid regeneration limits and voids in the ISCR
- The early stage ISR leaching model and the mass balance around the solvent extraction has been used to determine process streams and the total copper output for the project. However, due to assumptions made because of minimal inputs exact concentrations and flowrates of the organic or electrowinning streams may be subject to change. Solvent extraction testwork involving shake out tests for extraction and stripping is required to better understanding of recoveries and relevant O:A ratios and flow rates
- Recoveries are assumptions based on testwork and expected in-situ performance.

10. INFRASTRUCTURE

The Cobre Copper Project is situated within the Kalahari Copper Belt, specifically between the town limits of Ghanzi and Maun in Botswana. The Kalahari Copper Belt (KCB) extends 1,000 kilometres from northeast Botswana into Namibia and has emerged as a significant area for the discovery of sediment-hosted copper deposits.

In 2023, the KCB became a copper-producing district, hosting several mining operations, including Sandfire's Motheo Copper Mine and MMG Khoemacau Copper Project. Consequently, there are mining services and local infrastructure supporting operations in and around the area.

An extensive range of infrastructure is available in proximity and can be leveraged for the Cobre project. The property is well situated amidst other mining projects and nearby towns, implying that essential services such as water, power, and communications are likely to be readily accessible.

Additionally, the region has well-established road networks and ongoing power-related initiatives, such as the North-west Transmission Grid Connection (NWTGC), which aims to deliver electricity to the newly established KCB mines.

10.1 Site Access

10.1.1 Road

The Cobre Copper Project site is accessible via the A3 highway. However, due to its location approximately 50 km away from the highway, an additional access road will be necessary for direct entry to the site. This is depicted in Figure 10-1 Due to the site's connection to a major highway, the overall general road quality approaching the mine site is high. This reduces the risk of oversized loads encountering hazards and increases reliable and safe access to and from the site during the construction and operational phase.

The quality of the 50 km connecting site access road will need to be an all-weather access road suitably constructed with reliable foundations to ensure materials and equipment can be transported to and from site, while allowing the accommodation of heavy transportation vehicles.

A security gate will be installed at the site entrance, and perimeter fencing will be erected. Depending on the final location of the accommodation for on-site personnel, it may be beneficial to construct a connecting road between the camp, process facility and site offices.

Figure 10-1: A3 Highway Map, Botswana (Source: Google Maps)

10.1.2 Railway

The railway network in Botswana primarily extends along the eastern and southern parts of the country, with no rail lines passing through the northwestern region as shown in Figure 10-2. Hence there is no railway access to Cobre ISCR project.

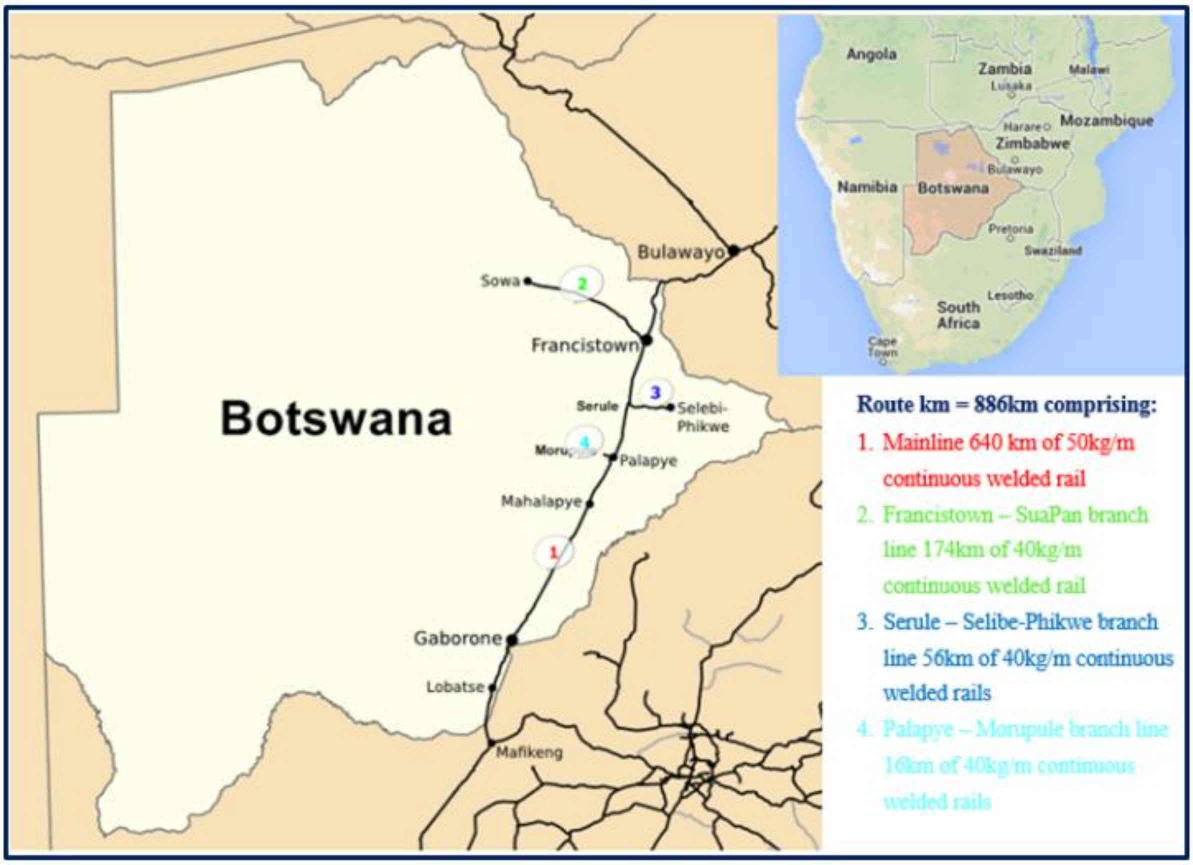

Figure 10-2: Botswana Railway Map (Botswana Railways, 2024)

10.1.3 Sea Port

As Botswana is a landlocked country, road access to foreign seaports necessitates crossing national borders. A regional map of southern Africa, depicted in Figure 10-3, highlights potential seaports that could be considered for the project's logistical requirements.

Figure 10-3 South of Africa Regional Map (Source: Google Maps)

In the location map Figure 10-3 a red symbol marks the location of the Cobre copper project in Botswana

Examples of potential seaports including road distance from site are as follows:

- East coast:
  - Durban, South Africa, 1700 km
  - Maputo, Mozambique, 1600 km.
- West coast:
  - Walvis Bay, Namibia, 1100 km.
- South coast
  - Cape Town, South Africa, 2200 km.
  - Gqeberha, South Africa, 2100 km.

An early preferred selection of seaport is Walvis Bay in Namibia, which is a major port with well-established infrastructure and the shortest distance to the project site. During procurement, construction and production this port can be used for the sea freight of equipment, consumables and reagents. Accessing route from the project to Walvis Bay is shown below in Figure 10-4.

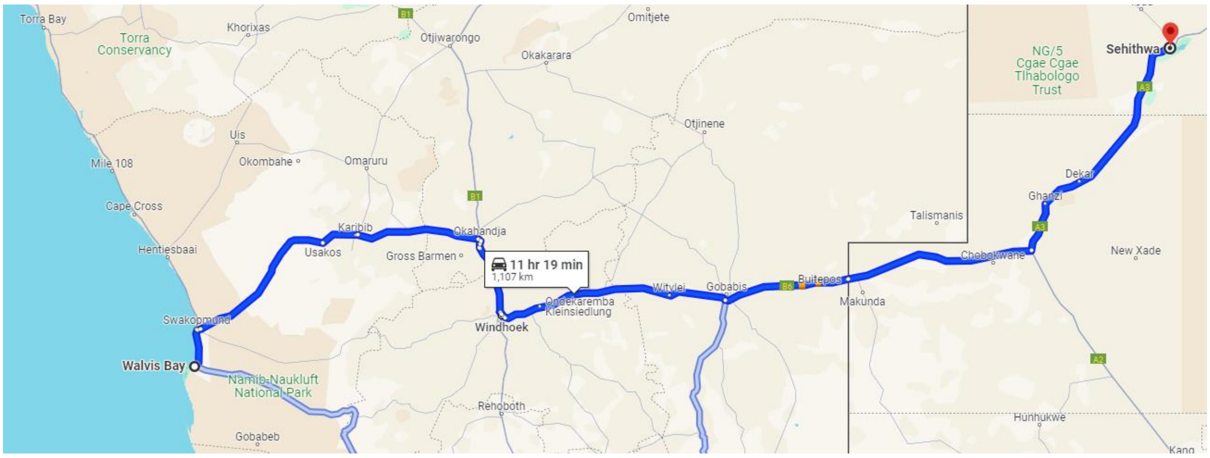

Figure 10-4 Route from Ngami Site to Walvis Bay (Source: Google Maps)

10.1.4 Airports

Two airports are identified in the region:

- Maun international airport
- Ghanzi Airport

Both airports are connected to the A3 highway and have direct road transport to the Ngami project site. Both Maun and Ghanzi airport are relatively close to the site with travel times approximately 80-minute and 100-minute along the A3 highway respectively.

Maun serves as the international airport and is larger than the Ghanzi airfield that is primarily used for charter and private flights. The close proximity of an international airport to site allows the easier access of suitable personal, consultants and contractors enhancing workforce availability and reliability through the project's construction and operation.

Maun international airport offers flights with a wide variety of charter operations as well as four larger aviation companies:

- Air Botswana
- SA Air Link
- Fast Jet Zimbabwe
- Mack-Air.

This gives flexibility to Cobre's operation.

10.2 Power

Botswana primarily relies on coal for electricity generation with approximately 79% of the installed capacity coming from coal-fired power stations, due to its abundant coal reserves, estimated to be around 192 billion tonnes. The next significant source is electricity imports, accounting for 19.9% of the total with diesel and solar power contributing minor shares of 0.4% and 0.1% respectively.

Given this energy distribution, it's likely that the Cobre In-situ Copper Recovery (ISCR) Project will source its power requirements from the existing power grid, which predominantly relies on coal-fired plants. However, it's essential to consider the integration of an onsite renewable energy alternative to promote environmentally friendly copper production with possible lower energy cost benefits to the project

10.2.1 Grid

An option to fulfill the power requirement for the project will be through a grid connection with Botswana Power Corporation (BPC). The ongoing Northwest Transmission Grid Connection (NWTGC) project, initiated in 2018, aims to extend the high-voltage electricity network to the Northwest, Chobe, and Ghanzi Districts. This expansion caters for the new power capacity demands and facilitates connections to areas supplied via cross-border power lines, integrating them into the national grid. The proposed gridlines are depicted in Figure 10-5, with the plant's location situated between Ghanzi and Maun, marked with a black circle for reference.

Given the plant's location away from the highway, it will be necessary to construct a 50-kilometer-long 132 kV overhead transmission line. Additionally, a new switching station will be established at the junction between the access road and the highway to facilitate the grid connection.

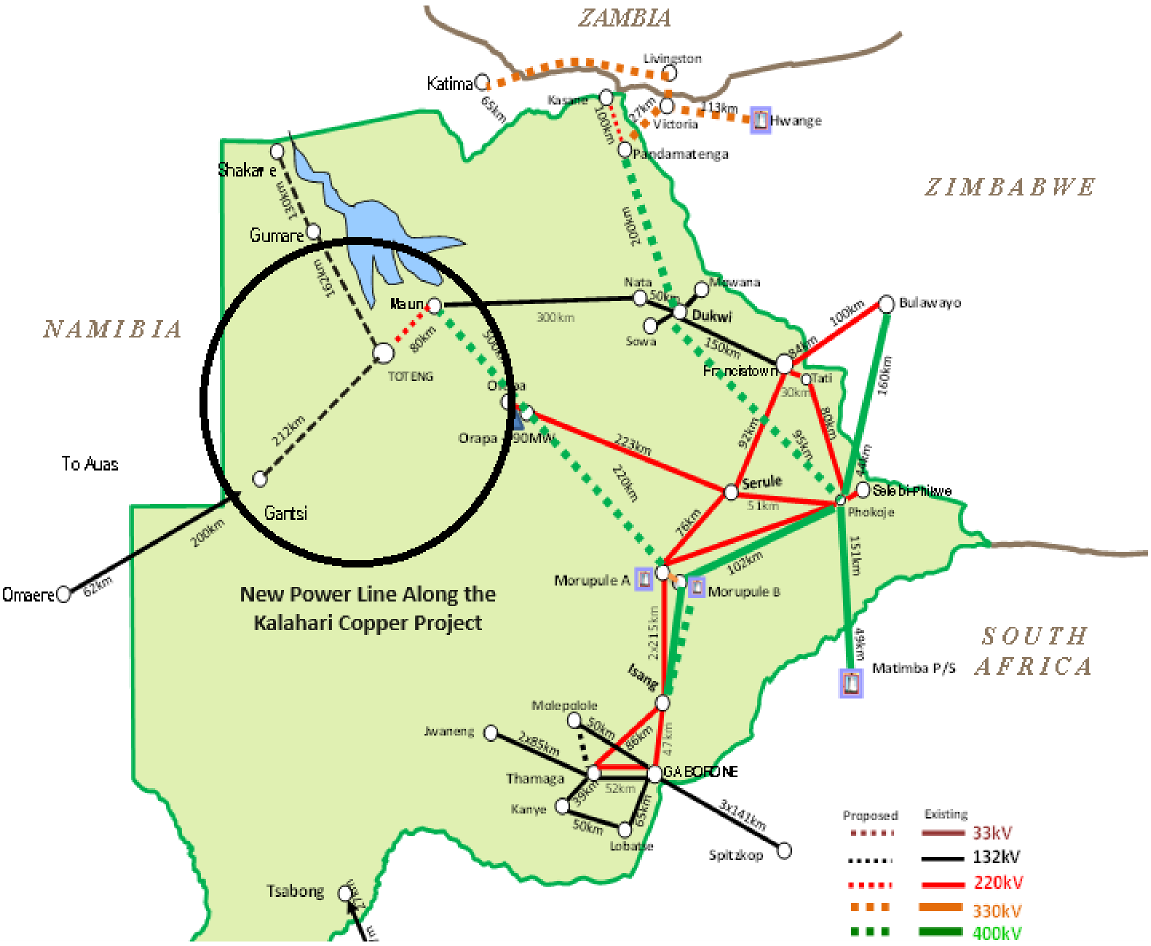

Figure 10-5: NorthWest Transmission Grid Connection (NWTGC) Grid Map (Botswana Power Corporation, 2015)

10.2.2 Onsite Power Generation

10.2.2.1 Diesel

Due to the capital cost of connecting to the grid an alternative is onsite power generation. The first alternative involves utilising diesel-powered engine generators (Gensets). These generators offer a cost-effective and adaptable solution. On-site, diesel fuel will be necessary for operating all plant vehicles, and emergency generators. Diesel will also be used as a backup thermal plant in the case of disruptions to the main grid. The fuel will be transported via tanker and stored in a dedicated facility. However, acquiring a substantial quantity of diesel from a nearby town such as Ghanzi would entail additional transportation costs. Consideration should be given to the high carbon footprint of diesel going forward.

10.2.2.2 Renewables

Cobre will consider integrating a renewable energy source into its power supply generation. The impact on power costs, minimising environmental impact, lowering greenhouse gas emissions, and enhancing the overall outlook for the Cobre Insitu Copper Recovery Project are key drivers for progressing adoption of renewable power generation onsite.

Among the available renewable energy options, solar energy stands out as the most viable choice.

- Wind Energy: Unfortunately, is not a feasible option in Botswana. The countrywide average wind speeds range from 2.0 to 3.5 meters per second, which falls short of the minimum requirements for efficient power generation.
- Hydroelectricity: While hydroelectric power can be a reliable source, Botswana faces challenges due to low and uneven rainfall. These conditions have led to severe water restrictions and supply interruptions, making hydroelectricity less practical.
- Solar Energy: Botswana enjoys abundant sunshine, with over 3,200 hours of sunlight per year. Additionally, the country experiences an average global irradiation of 21 megajoules per cubic meter per day. These favourable conditions make solar energy an excellent choice for renewable power generation. This is also depicted in Figure 10-6 below.
    - Daylight Hours: The average daylight hours in Botswana vary from 9.9 hours in summer to 8.2 hours in winter. This extended exposure to sunlight contributes to one of the highest insulation rates globally.

Although no companies have completed large scale solar projects to date, the Botswana Energy Regulation Authority (BERA) is pushing for 20% of all power within Botswana to be renewable by 2030. Moreover, the Botswana Ministry of Minerals and Energy has just signed a deal with the World Bank Group for AUD 188 million (USD 122 million) deal to construct renewable energy infrastructure. This project was approved on the 11th of July 2024. The Botswana Power Corporation (BCP) is implementing the project and If successful BCP is a potential supplier of solar infrastructure to the project.

The implementation of battery integration into the solar power generation system onsite is essential to allow the system to be fully utilised and to effectively support the operation.

Batteries will assist the site in increasing the grid stability while decreasing the diesel requirement from the site.

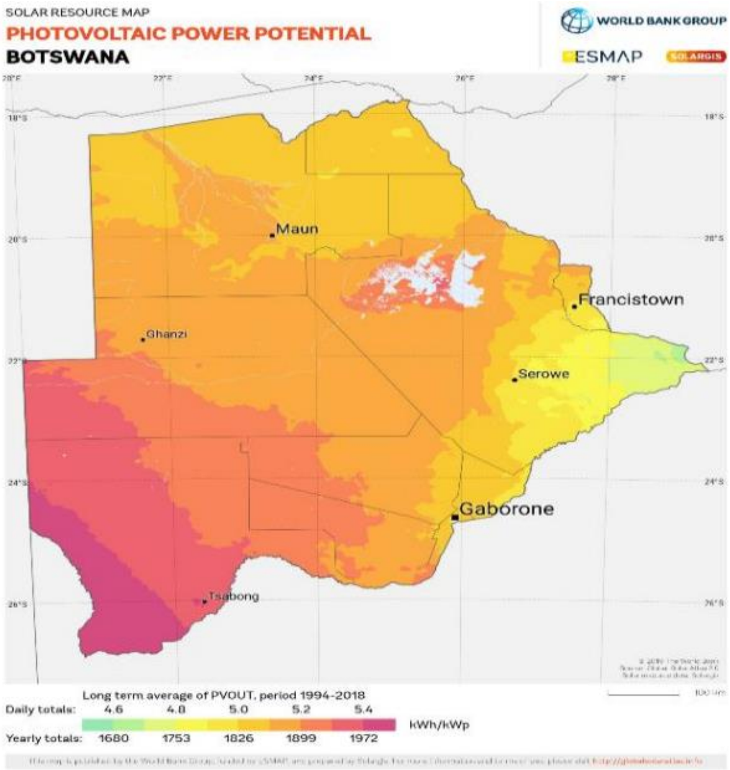

Figure 10-6: Solar Resource Botswana (Energy Catalyst, 2020)

By constructing an onsite solar power plant, Cobre can not only meet its power requirements but also ensure that the copper mined and processed is truly "green" copper—a sustainable choice for the environment.

10.3 Water

The raw water requirements for the processing plant will be met by sourcing from several nearby boreholes. However, hydrogeology studies must be conducted to determine the locations of these boreholes and assess their water quality and content. Subsequently, the water from the various boreholes will be pumped to a strategically located reservoir (or tanks) located in close proximity. From there, it will be transferred via a buried pipeline to the processing plant site.

An additional consideration for borehole placement to source water is in future ISCR wellfields. The aquifer could be drained ahead of ISCR wellfield development allowing for water to be sourced closer to site. Additional benefits of this approach include draining the wellfield prior to injecting lixiviant and reducing the dilution of the leach solution. Reduced pumping cost from distant borefield aquifers and reduced drilling cost for multipurpose boreholes.

Given the anticipated brackish nature of the bore water, the water will be treated to produce process water for the plant and further treatment to provide the site with potable water as required. Additionally, this water will also be used for safety showers, toilet facilities, kitchens, crib rooms and camp. Depending on the water quality, this water may be considered as source of Cl ions for leaching.

10.3.1 Surface Water

The only body of water is Lake Ngami which is a seasonal water source and is a considerable distance from site. In recent years Lake Ngami has a measured volume of 974 Mm^3. A portion of the water necessary for site upkeep could be sourced from the lake. Due to the unreliable rainfall within Boswana it is important to not overuse this natural water source, damaging the local ecosystem. The lake should also not be relied on for the primary source of water due to its unreliable volume. From 1980 to 2003 the lake underwent a dry phase, providing little to no water volume during this period. Since all other available water supplies need reduced total dissolved solids (TDS), salt from the lake could potentially be removed to have access to a reliable NaCl supply without any excess costs.

10.3.2 Ground Water

Ground water can be used to supply most of the water to the mine site. Currently in Botswana there is a myriad of sites that supply their own water to great success, with mines in Botswana making up 15% of the country's total water use. 85% of all mining water used is supplied by the mine sites themselves. Within the copper field in Botswana, Matsitama copper mine, Mowana copper mine, Boseto copper silver mine, all use ground water as their primary water source. BCL copper nickel mine supplies its water needs with fissure groundwater and subsidises this with dam water.

10.4 Waste Management

10.4.1 Sanitary Waste Disposal

Sanitary waste from sinks, lavatories, toilets, and showers is managed through septic systems. These systems are either dedicated to individual buildings or serve groups of ancillary facilities that share a common septic tank or leach field. The design and permitting of these septic systems will adhere to Botswana's regulations.

10.4.2 General/Process Related Waste Disposal

Sinks and drains associated with chemical handling operations will discharge into the tank farm sump, with the sump manually pumped out and directed to a dedicated chemical containment tank. These containment tanks are maintained by licensed hazardous materials handling personnel in compliance with relevant state and local government regulations.

Solid waste is collected in approved containers, then removed from the site by a solid waste contractor. Disposal follows appropriate regulations. Additionally, any excess construction materials and debris will be taken away from the site by the contractor responsible for generating them.

Non-hazardous recyclable materials, including scrap metal, paper, used oil, batteries, and wood products, will be placed in appropriate containers and recycled through the relevant vendors.

Hazardous materials, including contaminated greases, chemicals, paint, and reagents, will be gathered and, whenever feasible, recycled. Alternatively, they will be transported off-site for either destruction, treatment, or proper disposal.

10.5 Building and Facilities

The Cobre ISCR project will require several supporting plant area buildings, facilities and infrastructure which includes but not limited to:

- Laboratory
- Workshops
- Warehouses and storage facilities
- Site and administration buildings
- Fuel storage and dispensing station
- Fire protection systems
- Plant control room,
- MCC and switch rooms
- Security fences and gates
- Other Facilities (crib room, IT room, showers, toilets, change rooms, medical facilities)

10.6 Accommodations

The camp accommodation will be strategically situated within proximity of the mine. This strategic location and proximity to the village of Ghanzi ensures convenient access to food and water supplies. The camp facilities will include a kitchen, dining area, recreation room, storage facilities, laundry, and sleeping quarters to accommodate a specified number of individuals. Additionally, transportation will be provided for personnel commuting between the camp and the project site.

10.7 Communications

It is critical that Cobre has a comprehensive and reliable corporate network communication system at the processing site. Satellite telecommunications systems have a strong track record, especially since many other remote mining companies across Africa utilise similar systems. Cobre's responsibilities include providing corporate data services, communication networks, and necessary IT equipment (such as laptops, desktops, and printers). Additionally, the project site will require CCTV facilities to enhance site security and surveillance, along with a UHF/VHF two-way radio system.

11. LOGISTICS

11.1 Product

The main product onsite will be copper and the copper produced on site is LME grade copper cathode and will be bundled into lots. Additional byproducts produced alongside the copper cathode will be silver ingots and copper sulphate. For product exports via sea freight the nearest identified port of Walvis Bay in Namibia. The site is connected to Walvis Bay using the existing roads from Botswana as shown in Figure 11-1.

Due to the inland location of the site, the distance to Port and the value of the products it is important they are securely transported with appropriate procedures including a security detail. Transportation of the copper along the A2, that directly connects with N4 in south Africa, (Figure 12-1) may possibly be subjected to some risks due to incidents of rocks and spikes being used on sections of the N4 resulting in the robbing of some vehicles. Although these events have been reported closer to Pretoria, in South Africa, it is important to stay vigilant and be prepared. It should also be acknowledged that there is a substantial distance between these roads which does lower the risk, but awareness is important when transporting goods such as copper which requires limited further processing to turn it into copper tubing or wire from the LME grade product produced by Cobre Minerals.

Figure 11-1 South Africa N4 and Botswana A2 Connection (Source: Google Maps)

11.2 Shipment and Asset Tracking

During procurement, construction and operations a reliable shipment tracking method should be utilised to track shipment orders. This can be facilitated through the use of an established logistic provider. Ideally, the shipping tracking information should be easy to find and be able to cover all essential shipment descriptions including name, type, size, weight, current location, etc.

Shipment tracking is an essential tool for monitoring the transporting condition of procured assets when they are on the way from their shipping address to the destination. The information provided by the tracking system is irreplaceable for project management.

Barcode/QR code asset tracking and RFID tracking can be used to manage assets and equipment during the construction and commissioning phases. A breakdown of each viable options is provided.

11.2.1 Barcode Tracking

Barcode asset tracking is an easy-to-use and cost-effective way for businesses of all sizes to manage and track their physical assets. Whether being used for inventory and stock control or lifecycle management, there are two elements that make barcode asset tracking possible: a barcode label and a reader.

Barcode labels are available in a variety of different forms. From 1D barcodes such as Code 39 and Code 128 to 2D barcodes such as Data Matrix and Quick Response (QR) codes. Although their capabilities vary, each type of barcode label is used to store data. This data is represented by different numbers and letters, which are then decoded by a reader typically in the form of a barcode scanner or mobile device.

A key factor that makes barcode asset tracking particularly appealing to smaller businesses is the ability to print barcodes on-site. Once data has been assigned to a unique barcode, it is printed and affixed to an asset. Whether that be a business’s fixed assets, its IT assets such as monitors and keyboards, or its current assets such as stock and inventory.

As well as being an inexpensive replacement for time-consuming manual tracking methods such as pen and paper, barcode asset tracking offers a wide range of benefits such as:

- Increased inventory accuracy
- Speeding up asset data collection
- Lowering asset tracking costs
- Reducing errors
- Simplifying record-keeping
- Requiring almost no employee training

Barcodes require less hardware to operate compared to RFID and GPS tracking. All that’s needed to set up a successful barcode asset tracking system is:

- Barcodes

- A barcode scanner
- Asset Tracking Software

Once the right tools and equipment are in place, the process of barcode asset tracking can be broken down into three stages:

- Data is stored on a unique barcode that is printed and assigned to a specific asset.
- The barcode is scanned using a scanner or mobile device that extracts the data.
- The data is sent to a computer in binary form which is then decoded and stored in an Asset Tracking Software database.

11.2.1.1 QR Code

While barcode and QR code asset tracking solutions are both cost-effective, reliable, and easy to use, some clear differences may appeal to the way businesses deploy them for tracking assets.

Whereas slight damage to a barcode, such as a small tear or crease, can cause it to fail completely, a QR code can still operate as normal even with substantial damage. Only 30% of a QR code needs to be intact for a scan to be successful.

Not only this but they can be read by a scanner at various angles. Whereas a linear barcode needs to be scanned face-on.

Before choosing between a barcode or QR code asset tracking solution, businesses must consider their environment. For instance, in environments where labels can be easily damaged such as warehouses, stock rooms, or in transit, QR codes may seem a more suitable option.

Allowing scanners to read data both vertically and horizontally, as opposed to a single linear strip, means QR codes can store significantly more numerical data than a 1D barcode. Whereas barcodes can typically store up to 25 characters, a QR code can store up to 2500 numerical characters.

Having the ability to store more data enables QR codes to be used for various scenarios that benefit a business's asset-tracking processes, such as:

- Tracking asset locations
- Viewing asset maintenance and repair history
- Managing the asset lifecycle from procurement to disposal
- Building asset check-in and check-out systems

11.2.2 RFID Tracking

In the last 20 years, other asset tagging solutions have provided users with more advanced options for tracking business assets.

One asset tagging solution that has superseded barcodes is RFID. Although more expensive and time-consuming to deploy, an RFID system can offer more variety for businesses when compared side-by-side with barcode asset tracking tools.

In its simplest form, RFID asset tracking is a way of automating the management and locating process of physical assets. It works by loading an RFID tag with data and attaching it to a relevant asset. This data can include anything from name, condition, amount, and location.

Through an RFID tag's repeatedly pulsating radio waves, an RFID reader can capture the stored data. Eventually collecting it in a sophisticated asset tracking system where the data can be monitored and actioned. The benefits of RFID tracking include:

- Tracking multiple assets at any one time
- Eliminating human intervention
- Collecting data in real-time
- Improving asset visibility
- Locating lost or misplaced assets
- Maximising accuracy of inventory

Compared to Barcode tracking, RFID system features chips inside RFID tags, which makes RFID tracking more expensive than Barcode tracking.

However, RFID tracking has the following advantages compared to Barcode tracking:

- Wider detection range. RFID tags can be scanned up to 15 meters away and do not require the tag to be presented in a line of sight
- Faster scanning speed. Multiple RFID tags can be scanned together at once
- Higher durability. RFID tags are more difficult to be damaged and are designed for adverse environments like long-range transportation
- Bigger information storage space. RFID tags can contain up to 4 million characters while QR codes can only hold up to 2000 characters
- Security. RFID frequencies and tag types depend on location and provider which can be encrypted while barcodes standard is used and readable globally

11.2.3 GPS Tracking

The use of GPS (Global Positioning System) trackers allows users to actively track assets while in transit. By communicating with satellites, a GPS tracker can gain accurate real-time location data.

Although GPS tagging is expensive and ineffective for indoor tracking, location trackers are a popular choice for fleet management, logistics, and transport organisations.

11.2.4 NFC Tracking

NFC (Near field communication) is a popular technology that can be found in smartphones for the use of making payments. It's this worldwide recognition that has made NFC asset-tracking tools so efficient. By being accessible on mobile devices, specific tag readers or additional staff training is not needed.

Like QR codes, NFC tags enable users to register data in real time and streamline the access of information from their asset tracking system. Although NFC asset tags can be expensive, they can provide better capabilities for use outside and in adverse weather conditions.

11.3 Customs and Import Duties

As a rule, all goods imported except those previously exempted by law, are subject to import duties. The import duties are calculated on the original invoice price (CIF value). When the buyer does not present the original invoice, customs officials evaluate the market value of the product and apply the respective rate.

Imported goods to Botswana currently follow a 12% value added tax (VAT). To facilitate local businesses this cost is waved if the good are imported from any South African Customs Union (SACU) member. Equipment and goods from member countries should be considered to get around these fees. The current other members of SACU are:

- Lesotho
- Namibia
- South Africa
- Swaziland

11.4 Reagents and Consumables

Currently, the most feasible method to export the products out of Botswana is to transport the copper via truck to port for shipping. From the mine site, approximately 1.9 ktpa and 40 ktpa of copper will be transported 1,100 km to the Walvis Bay Port during Stage 1 and Stage 2 respectively.

Road transport of imported goods from the port to is also likely the most effective method to acquire reagents and other consumables.

Regarding reagents, Table 12-1 estimated total reagent uses for both stages.

Table 11-1 Reagent Consumption

Reagents	Consumption (tonnes per annum)	
	Stage 1	Stage 2
Sulfuric Acid	1,629	34,381

Ferric Sulphate	2,131	44,983
Sodium Chloride	1,717	36,243
Organic Solvent (Kerosene)	11	232
Organic Extractant (M5774)	11	232
Diesel	3,141,601L	TBD

11.5 Construction and Commissioning

Most equipment used for the project will need to be acquired from out of country. This includes processing equipment such as solvent extraction mixer settler units and electrowinning cells. For infrastructure and buildings however, suitable local companies can be used to develop the project. This will allow the project to assist the local economy and communities. Most of the largest construction companies within Botswana are in the southeast of the country, in Gaborone, such as Concor, UNIK Construction and SMEC Botswana. The Cobre Copper project is located approximately 800 km away from Gaborone, so for the duration of the construction of the project, the travel or remote work costs will have to be included and discussed with the chosen construction company to ensure an accurate pricing for the development of project infrastructure.

The commissioning of the site will be planned closer to the detailed design of the process, when exact equipment specifications are available.

11.6 Supply Chain Management & Plannings

Supply chain management outlines the strategy and activities that go into planning, sourcing, producing and delivering goods, as well as handling returns. Logistics focuses on the right products being in the right place at the right time, and how to get them there.

11.6.1 Supply Chain Planning

Supply chain planning is the process of planning a product from raw material all the way to distribution and sales – with the ultimate goal of balancing supply and demand. When the components of supply chain planning are fully integrated, supply chain planning is sometimes referred to as “integrated business planning”.

Figure 11.2 -Cobre Copper Project Supply Chain Planning

All the above are key elements or deliverables that must be developed before starting any procurement.

11.6.2 Supply Chain Management

At the most fundamental level, supply chain management (SCM) is management of the flow of goods, data, and finances related to a product or service, from the procurement of raw materials to the delivery of the product at its destination. SCM includes the following activities:

- Business planning and organising
- Production management
- Procurement management
- Logistics management
- Warehousing management
- Customer service management

Figure 11-3 Supply Chain Management Example

11.6.3 Supply Chain Software

Supply chain management is a complex process with many moving parts over time. Experience has shown that having good software on hand is the only way to handle this complex problem and track progress.

Pronto Xi Supply Chain application provides full visibility from planning distribution and forecasting stock requirements to complete warehouse management. It is recommended to use Pronto Xi to aid the logistic service management.

The Pronto Xi platform can be easily aligned to supply chain processes via turnkey customisations, so that demand can be matched efficiently to supply.

To eliminate unnecessary waste, teams can leverage captured data to predict the trends and customer demands with Pronto Xi Advanced Forecasting. Cash flow can be improved with advanced statistical methods, smoothing and visualisations, all supporting lean inventory processes.

With a single view of orders, shipments and inventory, teams have the visibility needed to improve agility when responding to any disruption along with the intelligence to maximise every opportunity to increase profitability.

12. CAPEX

METS developed a cost estimate for the proposed NCP project. This provides substantiated costs for the project infrastructure and to aid in the economic assessment. The overall CAPEX estimation was consolidated by METS utilising METS estimating procedures and systems. This section describes the basis of the CAPEX estimate including inputs and capital requirements for each area. The CAPEX is provided in Appendix F.

12.1 Basis of the Estimate

Where costs have not been procured from available suppliers/local vendors, the CAPEX has been estimated based on an in-house database built from previous experience, online research, vendor quotes along with factors to account for costs such as concrete, steelworks, piping and installation. Equipment was scaled up or down where required using appropriate scaling factors.

12.1.1 Estimate Accuracy

The capital cost is estimated at scoping study level for this study work with an order of accuracy +50% or -30%, within the expected accuracy of a AACE Class 4 Estimate.

12.1.2 Currency Exchange Rates

All monetary figures are reported in Australian Dollars (AUD). To convert the currency from foreign currency to Australian dollars, the following rates have been used:

Table 12-1 Conversion Rates

Currency	A$ AUD	Pula BWP	US $ USD	Euro € EUR
1 AUD	1.00	9.07	0.65	0.59

12.1.3 Qualifications and Exclusions

The following items have been excluded from the capital cost estimate

- Loss of income due to shutdowns
- Licence fees
- Construction / modification of roads and / or rail outside of battery limits
- Goods and Services Tax (GST)
- Project permitting (such as environmental permits etc.) and any legal fees
- Construction insurances and liability insurances during construction
- Financing costs (fees, closing costs etc. incurred for securing finance)

- Product distribution costs (from plant to customer)
- Economic development (any costs incurred to incentivise the local community to embrace the project)
- Mobilisation and demobilisation costs for contractors working on site.
- Unexpected site development costs – suitable land for construction has been assumed
- Escalation over the life of the project has not been considered for the construction period
- Land acquisition costs and fees
- Future development capital or expansion project

12.2 Direct Cost

All direct equipment and infrastructure costs are assumed to be new for this cost estimate and no second-hand purchases are included. Costs have been developed as installed costs including provision for earthworks, concrete, structural steelwork, mechanical installation, pipework, electrical and instrumentation, roads, infrastructure and freight.

Costs are factored from the direct equipment cost to consider the above factors to provide an indicative cost of the equipment installed. Generally, this will range from 75-100% of the equipment cost. This has only been applied to costs that have not been supplied as installed costs.

Costs are factored from the direct equipment cost to provide an indicative cost of the equipment installed. This has only been applied to costs that have not been supplied as installed costs. Direct costs will include provisional factors to account for the below requirements for installation.

12.2.1 Earthworks

A provisional factor of 5% of the equipment cost has been included to account for the following works associated with earthworks:

- Clearing of the site of vegetation
- Grubbing of roots and other materials from the site
- Bulk Earthworks
- Initial grading of the site for construction
- Major excavation (by machine) for concrete foundations
- Major backfilling (by machine) for concrete foundations
- Final grading and drainage contouring of the site

- Paving.

12.2.2 Concrete

A provisional factor of 2% of the equipment cost has been included to account for the following works associated with concrete:

- Final trimming of the excavations
- Supplying and setting of formworks and shoring
- Supplying and installing reinforcing steel
- Supplying and installing embedded items
- Supplying and placing mixed concrete
- Finishing of the concrete
- Curing of the concrete
- Stripping of the formwork and shoring
- Final patching and finish
- Protective coatings for concrete surfaces
- Supplying and installing pre-cast concrete
- Supplying and installing concrete masonry.

12.2.3 Structural steel

A provisional factor of 10% of the equipment cost has been included to account for the following works associated with structural steel:

- Detailing of structural steel from engineers' drawings
- Supply and fabrication of steel materials and their fastenings
- Dismantling and salvage of steel materials
- Sandblasting and painting as required
- Transporting steel to site
- Unloading and "shaking-out" of steel in laydown areas
- Transporting steel to erection areas
- Checking the concrete dimensions before erection

- Erecting structural steel
- Plumbing and alignment of erected steel structures
- Tightening of all bolts according to specification
- Installation of metal roof and wall sheeting
- Installation of all ventilators and louvre
- Installation of doors and windows including frames
- Installation of flashing, edge strips, and sealers
- Installation of gutters and downspouts.

12.2.4 Mechanical installation

A provisional factor of 35% of the equipment cost has been included to account for the following works associated with mechanical installation:

- Furnishing of the equipment by vendors
- Dismantling and salvaging equipment
- Transporting the equipment to the site
- Unloading and storing on site
- Installing the equipment
- Mechanical testing of the equipment prior to start-up
- Sole plates, anchor bolts, safety guards, and all other items necessary to make the equipment operable

12.2.5 Pipework

A provisional factor of 10% of the equipment cost has been included to account for the following works associated with pipework:

- Furnishing all pipe, valves, and fittings
- Fabricating all pipe in a shop or on-site
- Installing all pipe, valves, and fittings
- Installing pipeline bodies for instruments
- Installing instrument airlines to final block valve

- Cleaning of the pipelines
- Testing the pipelines.

12.2.6 Electrical and instrumentation

A provisional factor of 7% of the equipment cost has been included to account for the following works associated with electrical and instrumentation:

- Installing all electrical equipment
- Installing all pull boxes, junction boxes, etc
- Installing all electrical cable and wire
- Furnishing all electrical equipment and bulk materials
- Dismantling and salvaging electrical equipment
- Installing all cable tray and conduit
- Furnishing and installing all hangers and supports
- Connecting all terminations
- Testing of all circuits and high voltage splices
- Furnishing all instruments at the site
- Bench testing and calibration of all instruments as required prior to installation.
- Furnishing and installing all supports and hangers
- Installing all pipe in-line instruments in pipeline bodies
- Installing all instrument airlines from block valve to instrument
- Installing all wiring between controllers, instruments, instrument blocks, power sources, and sending units
- Testing of all instrument's interlocks etc. after installation

12.2.7 Roads

A provisional factor of 2% of the equipment cost has been included to account for the following works associated with roads:

- Construction of roads for the project

12.2.8 Freight

A provisional factor of 9% of the equipment cost has been included to account for the following works associated with freight:

- Freight costs associated transportation of equipment

12.3 Indirect Costs

All indirect costs were calculated by factoring from the direct costs. The indirect costs for the different extraction methods include:

12.3.1 Working capital

Cost associated with day-to-day regular operations such as managing materials, labour and other expenses for a certain production level. The working capital is assumed to be 10% of the total direct costs. This also includes the costs associated with first fill reagents, operating consumable, fuel and lubricants.

12.3.2 Insurance

Cost associated with the protection of major equipment from damage during transit. The cost of insurance is assumed to be 3% of the total Equipment costs.

12.3.3 Engineering and procurement

EPCM is assumed to be 10% of the Direct costs.

- Revising the Mission engineering drawings to accommodate the revised elevations and coordinates
- Performing engineering on new equipment and associated equipment
- Planning, prioritising, and coordinating the engineering work.
- Review or various trade-off studies to minimize installation costs.
- Review and finalisation of the design criteria
- Review and finalisation of the process flow sheet drawings
- Development of all process calculations
- Preparation of the Water Balance
- Preparation of the Material Balance
- Final sizing of all new equipment
- Development of the Equipment List

- Preparation of the Piping and Instrument Diagrams (P&IDs)
- Review of existing drawings
- Site visits as required.
- Meetings as required.
- Checking and collecting on-site dimensions
- Coordinate and evaluate geotechnical studies and reports
- Surveying
- Preparation of the General Arrangement Drawings
- Preparation of Detail Engineering drawings
- Preparation of all Civil and Site drawings
- Preparation of Electrical cable and conduit drawings
- Preparation of all Instrumentation layout drawings
- All other drawings required to provide a complete engineering design
- Preparation of specifications for new equipment
- Preparation of Requests for Quotation (RFQs)
- Preparation of contractor bid documents
- Evaluation of all bids
- Recommendations for all bids
- Preparation of the contract or purchase order documents
- Processing all change orders to contracts and purchase orders
- Preparation of the project schedule
- Preparation of the operating cost estimate
- Preparation of the capital cost estimate
- Provision of technical assistance during construction
- Provision of changes to the design during construction
- Management and administration of the engineering work

- Travel, communications, living cost, supplies, computers, and all other costs necessary to engineer and procure for the project

12.3.4 Owner's costs

Costs associated with legal terms, inspections, training, etc. The cost is assumed to be 3% of the total direct costs.

12.3.5 Contingency

A provision of funds (30% of the total direct costs) set aside to allow for a margin of error in the estimate based on the confidence limits of:

- Equipment estimates (CAPEX)
- Material and labour rate accuracy
- The level of detail allowed for in the design
- Miscellaneous and unexpected costs

12.3.6 Commissioning

An allowance for labour costs incurred during commissioning is assumed to be 5% of the total direct costs.

12.3.7 Workforce accommodation & meals, temp services

Cost associated with the workforce and their livelihood which consists of accommodation and food. It is assumed to be 2% of direct costs.

12.3.8 Spares and tools

An allowance for the spare parts of the equipment and tools is assumed to be 2% of the total mechanical costs.

12.4 Capital Costs

A summary of the overall capital cost estimates is provided in Table 12-2.

Table 12-2 CAPEX Summary

Description	Stage 1 Capital Cost Estimation	Stage 2 Capital Cost Estimation
Total Direct Costs AUD	$34,364,036.70	$244,847,959
Total Indirect Costs AUD	$22,031,165.75	$156,974,747
Total Capital Cost AUD	$56,395,202.45	$401,822,706

Description	Stage 1 Capital Cost Estimation	Stage 2 Capital Cost Estimation
Total Capital Cost USD	$36,667,881.96	$261,263,138

Table 12-3 Direct Costs Breakdown

Direct Cost	Stage 1 Cost AUD	Stage 2 Cost AUD
Equipment	$19,091,131	$136,026,644
Roads	$381,822	$2,720,532
Electrical and Instrumentation	$1,336,379	$9,521,865
Freight	$1,718,201	$12,242,397
Pipework	$1,909,113	$13,602,664
Structural Steelwork	$1,909,113	$13,602,664
Concrete	$381,822	$2,720,532
Mechanical Installation	$6,681,896	$47,609,325
Earthworks	$954,556	$6,801,332
Total Direct Costs	**$34,364,036**	**$244,847,959**

Table 12-4 Indirect Costs Breakdown

Indirect Cost	Stage 1 Cost AUD	Stage 2 Cost AUD
Spares and tools Costs	$381,822	$2,720,532
Workforce Accommodation & Meals Costs	$687,280	$4,896,959
Commissioning Costs	$1,718,201	$12,242,397
Contingency Costs	$10,309,211	$73,454,387
Owner’s Costs	$1,030,921	$7,345,438
EPCM Costs	$3,436,403	$24,484,795
Insurance Costs	$1,030,921	$7,345,438
Working Capital Costs	$3,436,403	$24,484,795
Total Indirect Costs	**$22,031,165**	**$156,974,747**

12.5 Key Discipline Capital Costs – Stage 1

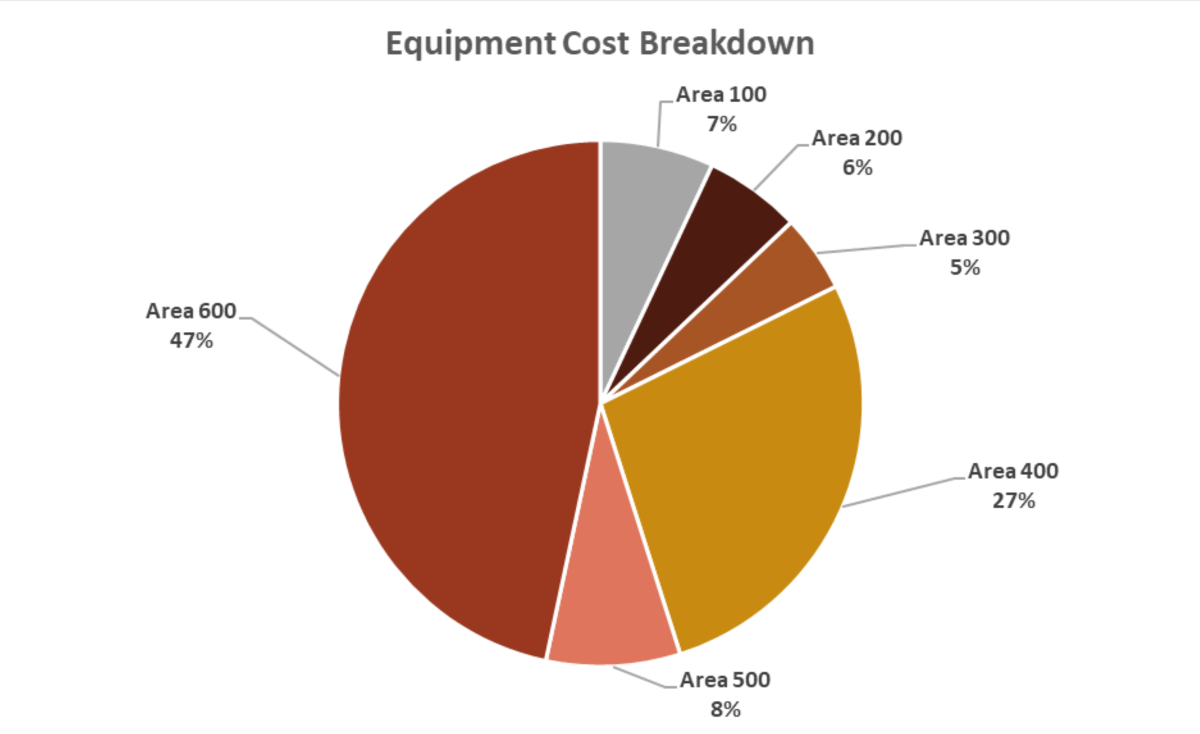

Figure 12-1 Stage 1 Equipment costs breakdown

12.5.1 Site Infrastructure: Area 600

The site infrastructure area contributes the highest percentage to the sum equipment cost at 47%. The major costs in this section are:

- The power package (Gensets, controlling system, power station)
- The air package (Air filters, compressors, dryer, receiver)
- Water treatment system (Bore water treatment plant and RO treatment plant)
- Diesel storage package (Diesel bowser, storage tanks, pumps)
- Site communication (CCTV, FM rebroadcasting, satellite dish, Wi-Fi, WAN etc)
- Plant control system
- Buildings (workshops, warehouse, gatehouse, laboratory, kitchen and accommodation facilities)

12.5.2 Electrowinning: Area 500

Area 500 makes up 8 % of the sum equipment cost. The major costs in this section are:

- The flash dryer
- The electrowinning cells (inclusive of cathodes, anodes, cathode lifting frame, cathode washing and stripping equipment)

12.5.3 Solvent Extraction: Area 400

Area 400 makes up 27 % of the sum equipment cost which is the second highest contribution. The major costs in this section are:

- The solvent extraction package (2 extraction mixer and settlers and 2 stripping mixer and settlers)

12.5.4 Silver Precipitation: Area 300

Area 300 makes up 5% of the sum equipment cost which is the lowest contribution. The major costs in this section are:

- 2 Clarifiers

12.5.5 Tank Farm and Ponds: Area 200

Area 200 makes up 6% of the sum equipment cost which is the lowest contribution. The major costs in this section are:

- The thickener
- The construction of storage ponds (Raffinate, PLS, ILS, Tailings, and Raw water ponds)

12.5.6 In-situ Wellfield: Area 100

Area 100 makes up 7% of the sum equipment cost which is the lowest contribution. The major costs in this section are:

- Well development (3 injection wells and 6 monitoring wells)

12.6 Key Discipline Capital Costs – Stage 2

Stage 2 capital cost breakdown by area is shown in Figure 12-2. Wellfield cost contribution from stage 1 to stage 2 increases from 7% to 20% contribution. Also notable is the decrease contribution from Area 600 site service due to the philosophy change between stage 1 and stage 2 in the requirement for onsite power generation. Stage 2 will use power sourced from the grid this will reduce the capital cost of onsite service for power generation.

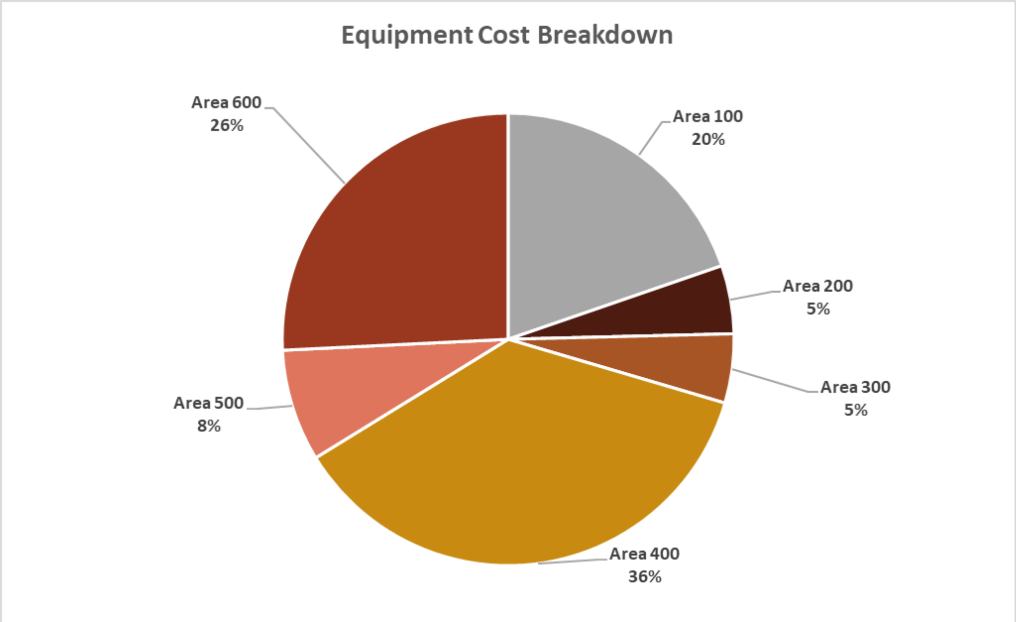

Figure 12-2 Stage 2 Equipment costs breakdown

13. OPEX

13.1 Basis of the Estimate

Operating costs were determined for In-situ Copper Recovery (ISCR) at a scoping level. The overall operating cost estimate was consolidated by METS using METS estimating procedures and systems. These are based on an in-house database built from previous experience, online research and vendor quotes. All monetary figures were reported in Australian Dollars with United States Dollars conversions reported for key values. The conversion rates used is shown in Table 13-1.

Table 13-1 Conversion Rates

Currency	A$ AUD	Pula BWP	US $ USD	Euro € EUR
1 AUD	1.00	9.07	0.65	0.59

This section describes the methodology behind creating the OPEX including all the assumptions used for each area. The OPEX summary is shown in Appendix G.

13.1.1 Estimate Accuracy

This OPEX is estimated at scoping study level for this study work with an accuracy at ± 30%.

13.1.2 Qualifications and exclusions

The operating estimate excludes:

- Currency fluctuations
- Bonds
- Support service at the head office
- Royalties and taxes
- Insurance other than works compensation and insurance covering the process plant

13.2 Methodology

The operating cost estimate was principally developed based on assumptions and indicative estimates of the factors driving operating costs. These comprise of the following:

- Power
- Consumables
- Reagents

- Logistics
- Labour
- Maintenance
- General and Administrative Costs (G&A)

13.3 Operating Costs

A summary of the overall operating cost estimates for both stages is provided in the Table 13-2.

Table 13-2 Operating Costs Summary

Description	Stage 1 Operating Cost Estimation	Stage 2 Operating Cost Estimation
Total Operating Cost USD	$12,068,895	$72,020,572
USD/t ROM	$6,342.21	$1,800.60
USD/lb of copper	$2.88	$0.82
Total Operating Cost AUD	$18,561,960	$110,767,640
AUD/t ROM	$9,754.32	$2,769.33
AUD/lb of copper	$4.42	$1.26

Table 13-3, Figure 13-1 and Figure 13-2 show the breakdown of the operating cost for both stages of the ISCR.

Table 13-3 Operating Cost Breakdown

Description	Stage 1 Cost (AUD)	Stage 2 Cost (AUD)
Reagents	$1,949,274	$41,147,215
Labour	$3,268,000.00	$4,606,000
Consumables	$1,909,113	$13,602,664
Power	$5,796,003.20	$19,060,648
Maintenance	$954,557	$8,161,598

G & A and Offsite	$2,685,014.40	$4,189,513
Water Treatment	$2,000,000.00	$20,000,000
Total AUD	**$18,561,960.89**	**$110,767,64**
Total USD	**$12,068,895.25**	**$72,020,572**

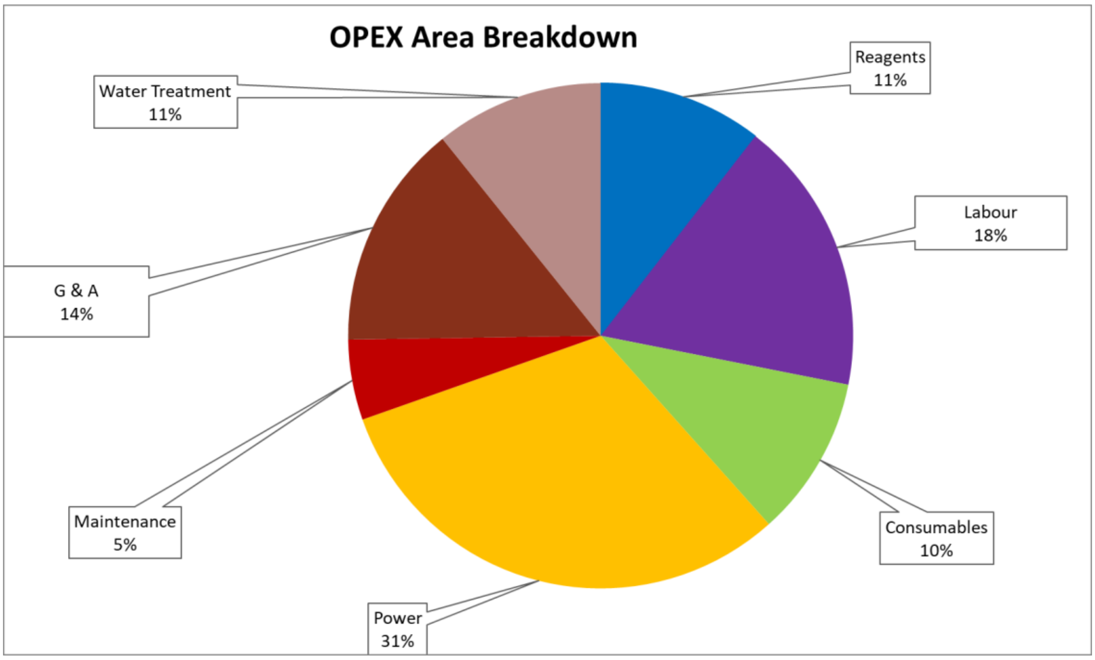

Figure 13-1 Stage 1 Operating Cost Breakdown

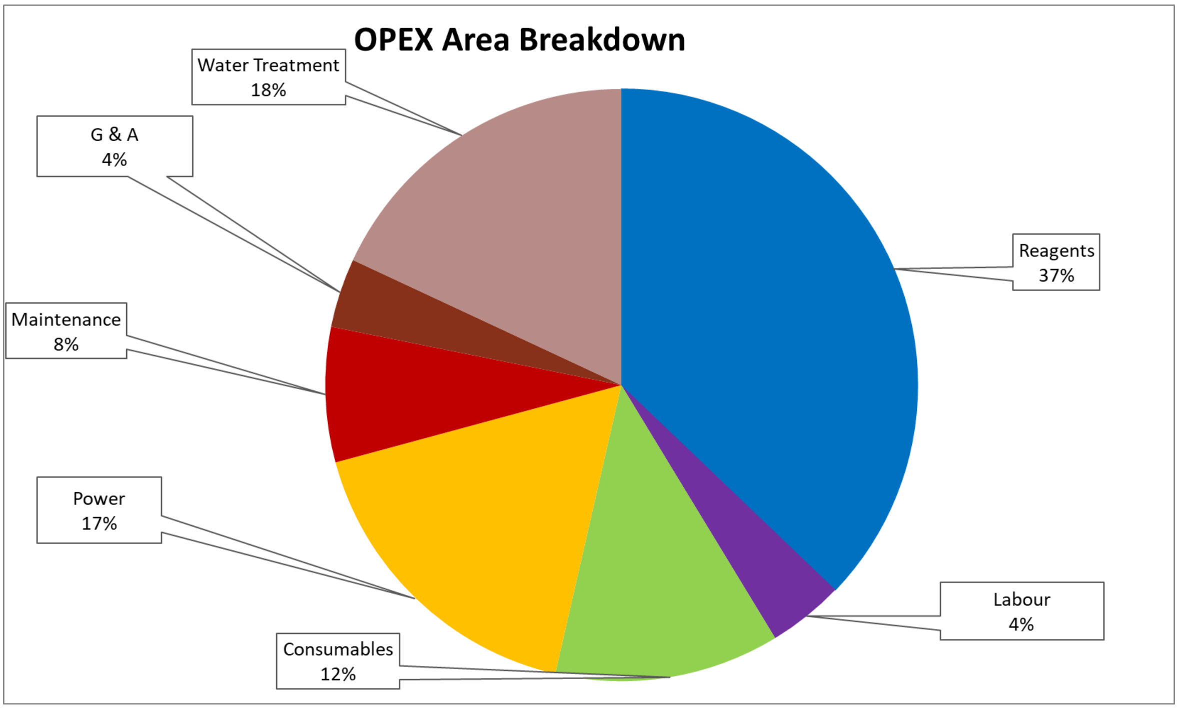

Figure 13-2 Stage 2 Operating Cost Breakdown

The OPEX is also divided into fixed and variable costs which is shown in Table 13-4 and Table 13-5 for Stage 1 and Stage 2 respectively. Generally, the fixed costs are the expenses that will remain the same regardless of production whilst variable costs are any expenses that change based on the rate of production and product sells.

Table 13-4 Stage 1 OPEX Fixed and Variable Costs

Description	AUD/a	Fixed %	Fixed Cost AUD/a	Variable AUD/a
Reagents	$1,949,273.56	5%	$97,464	$1,851,810
Labour	$3,268,000.00	100%	$3,268,000	$0
Consumables	$1,909,113.15	0%	$0	$1,909,113
Power	$5,796,003.20	15%	$869,400	$4,926,603
Maintenance	$954,556.58	15%	$143,183	$811,373
G & A	$2,685,014.40	100%	$2,685,014	$0
Water Treatment	$2,000,000.00	100%	$2,000,000	$0
Total	**$18,561,960.89**	**66%**	**$9,063,062**	**$9,498,899**

Table 13-5 Stage 2 OPEX Fixed and Variable Costs

Description	AUD/a	Fixed %	Fixed Cost AUD/a	Variable AUD/a
Reagents	$41,147,215.58	5%	$2,057,361	$39,089,855
Labour	$4,606,000.00	100%	$4,606,000	$0
Consumables	$13,602,664.41	0%	$0	$13,602,664
Power	$19,060,648.45	15%	$2,859,097	$16,201,551
Maintenance	$8,161,598.65	15%	$1,224,240	$6,937,359
G & A	$4,189,513.60	100%	$4,189,514	$0
Water Treatment	$20,000,000.00	100%	$20,000,000	$0
Total	**$110,767,640.68**	**12%**	**$34,936,211**	**$75,831,429**

- Labour, general and administration and water treatment costs are 100% fixed costs for this model.
- The sum of reagents cost is made up of a 5% fixed cost and 95% variable cost. Since reagents are raw materials in this process, low production means there are no restocking requirements due to low usage
- Consumables costs are 100% variable costs for this model
- Power and maintenance costs are 15% fixed costs and 85% variable costs. If production is low the power consumption will be low and there will be no need for maintenance if there is a low rate of operation.

13.4 Opex Breakdown

13.4.1 Reagents Costs

Reagent costs are provided based on METS' pervious projects and database, quotes from vendor and online sources. The costs are inclusive of 10% freight and consumption rates are estimated based on METS calculation, vendor information, and experience. The reagents prices used are:

- Sulfuric Acid - 240.00 AUD/t
- Ferric Sulphate - 430.00 AUD/t
- Sodium Chloride - 280.00 AUD/t
- Organic Solvent (Kerosene) -1400.00 AUD/t

- Organic Extractant (M5774) - 8000.00 AUD/t

The reagent cost breakdown is given in for stage 1 and stage 2 are given in Figure 13-3 and Figure 13-4 respectively.

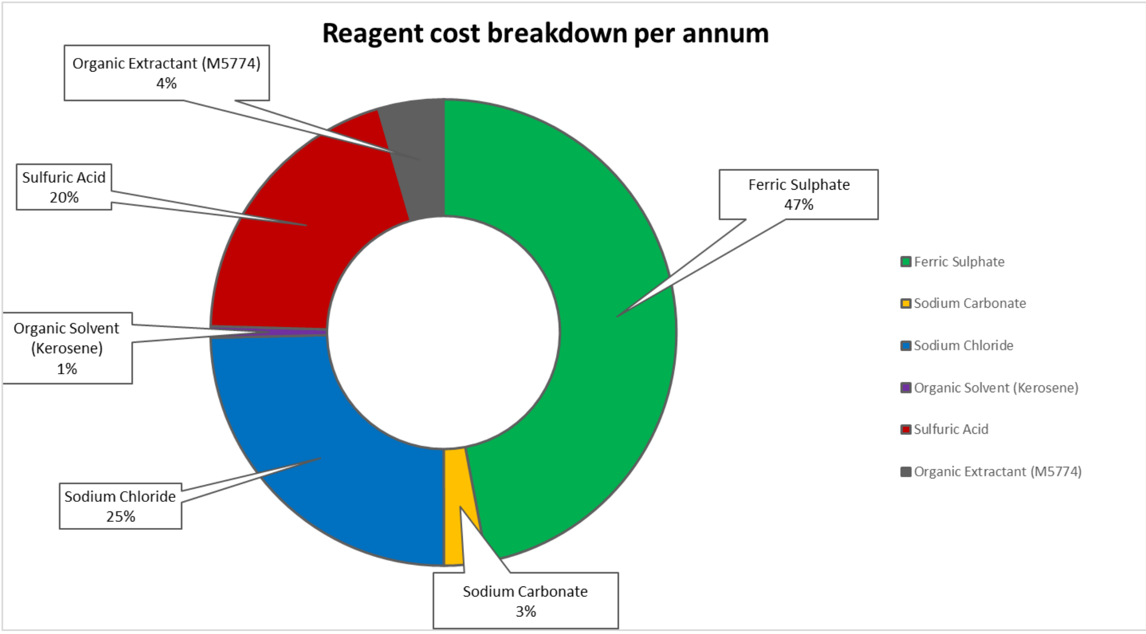

Figure 13-3 Stage 1 Reagent Cost Breakdown

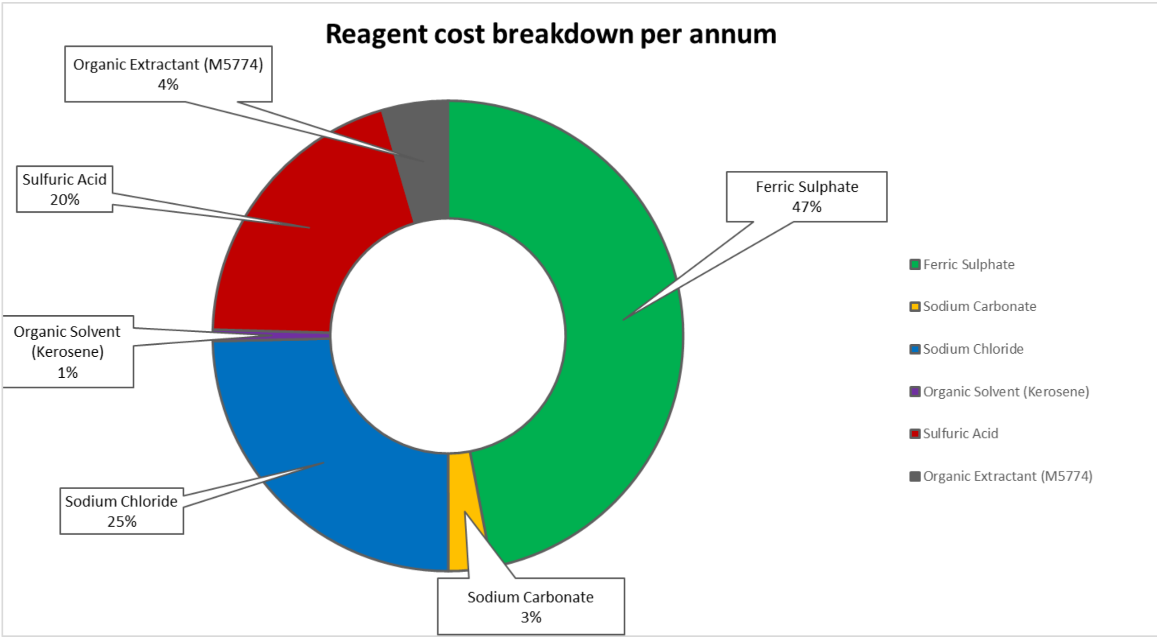

Figure 13-4 Stage 2 Reagent Cost Breakdown

Reagents make up 11% and 40% of the total OPEX for Stage 1 and Stage 2 of the project respectively. The current values for the OPEX are acquired through mass balance calculations, current Cobre NCP testwork and similar project's calculations. As additional testwork is completed as the project progresses more refinement of the reagent usage will be established.

In Stage 2 Reagents contribute the most to the sum operational cost. In this stage of the project more reagents are consumed due to the increase in the number of operational well fields. However, the reagent cost breakdown is the same as the one in Stage 1 since the same process pathway is being followed in both stages.

- Ferric sulphate makes up 47% of the reagent costs due to having the highest consumption rate. The regeneration of ferrous to ferric has not been modelled at scoping study. The reagent consumption can be reduced with additional testwork and modelling.
- Sodium carbonate makes up 3 % of the sum cost.
- Sodium chloride makes up 25% of the sum cost.
- Organic solvent makes up 1% and organic extractant makes up 4% of the sum reagent cost. These values are dependent on the type of extractant used because extractant to diluent mixing ratios are variable.
- Sulfuric acid makes up 20% of the reagent cost. This process requires low pH values for high efficiency and sulphuric acid is used to maintain this. The reagent should be readily available throughout the plant.

13.4.2 Labour Cost

The salary scheme used was built from the combination of information from METS's previous projects, database and online sources. Namely the salary data used for this scheme is from the Botswana Average Salary Survey. In positions where discrepancies in the salary scheme are observed due to differences in the level of seniority, average salaries are used. All rosters are based on 12 hours/shift.

The labour cost is the second highest contributor to the stage 1 operating cost making up 18% whilst it makes up 4% in stage 2 as the cost to scale up labour force is minimal to cover the larger plant. The labour force is mostly made up of local labour with four main expats in positions which require high expertise. A total of 88 people in stage 1 and 114 in stage 2 will be employed for stage 1 of the project with either a roster of 5 days on,2 days off or 8 days on,6 days off. The labour force will increase in stage 2 due to the expansion of the project. A total of 114 people will be employed with additions to wellfield maintenance and management.

13.4.3 Consumables Costs

Operating consumables are assumed to be 10% of equipment cost. Consumable costs are provided based on METS's pervious projects and database, quote from vendor and online sources. Consumption rates are estimated based on vendor information, METS calculations and experience.

13.4.4 Power Costs

The Scoping Study was based on a plant operation with electrical power sourced completely from gensets in stage 1 and the power grid in stage 2. A price of diesel in Botswana was sourced and pegged at AUD 1.84/L. A price for power used for mining purposes in Botswana was pegged at AUD $ 0.13. The power requirement was estimated based on the equipment list generated from the process flowsheets and scaling of equipment loads assuming utilisation of 90% in process and 95% site infrastructure. The power cost estimates do not include power required and or used for the buildings.

The power cost is the highest contributor to the stage 1 operating sum cost making up 31%. The power breakdown according to the plant areas is shown in Figure 13-5.

- Area 100 makes up 12% of the sum power cost. The injection and recovery pumps require relatively high amounts of power for effective operation at this level
- Area 200 makes up 3% of the power cost
- Area 300 makes up 6% of the power cost. This amount will increase relatively if the amount of silver in the system increases due to elevated silver production
- Area 400 makes up 8% of the power cost
- Area 500 makes up 58% which is the highest cost contribution due to the tank house having the highest power consumption. The electrowinning cells should constantly be online and running for high efficiency
- Area 600 makes up 13% of the power cost. The water systems in Area 600 use up a lot of power on operation especially the water bore systems which pump water from underground.

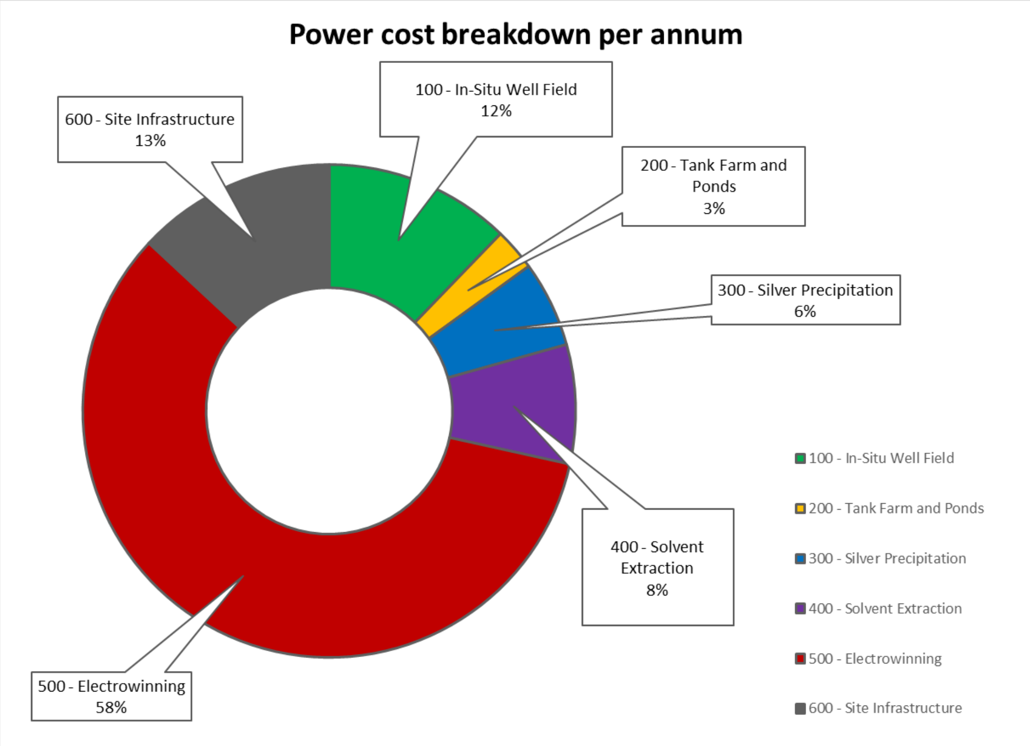

Figure 13-5 Stage 1 Power Cost Breakdown

The power cost contributes 15% to the operating sum cost in stage 2. The power breakdown according to the plant areas is shown in Figure 13-6 .

- Area 100 makes up 7% of the sum power cost. The injection and recovery pumps require relatively high amounts of power for effective operation at this level
- Area 200 makes up 2% of the power cost

- Area 300 makes up 4% of the power cost. This amount will increase relatively if the amount of silver in the system increases due to elevated silver production
- Area 400 makes up 7% of the power cost
- Area 500 makes up 73% which is the highest cost contribution due to the area having the highest power consumption. The electrowinning cells should constantly be online and running for high efficiency
- Area 600 makes up 7% of the power cost. The water systems in Area 600 use up a lot of power on operation especially the water bore systems which pump water from underground.

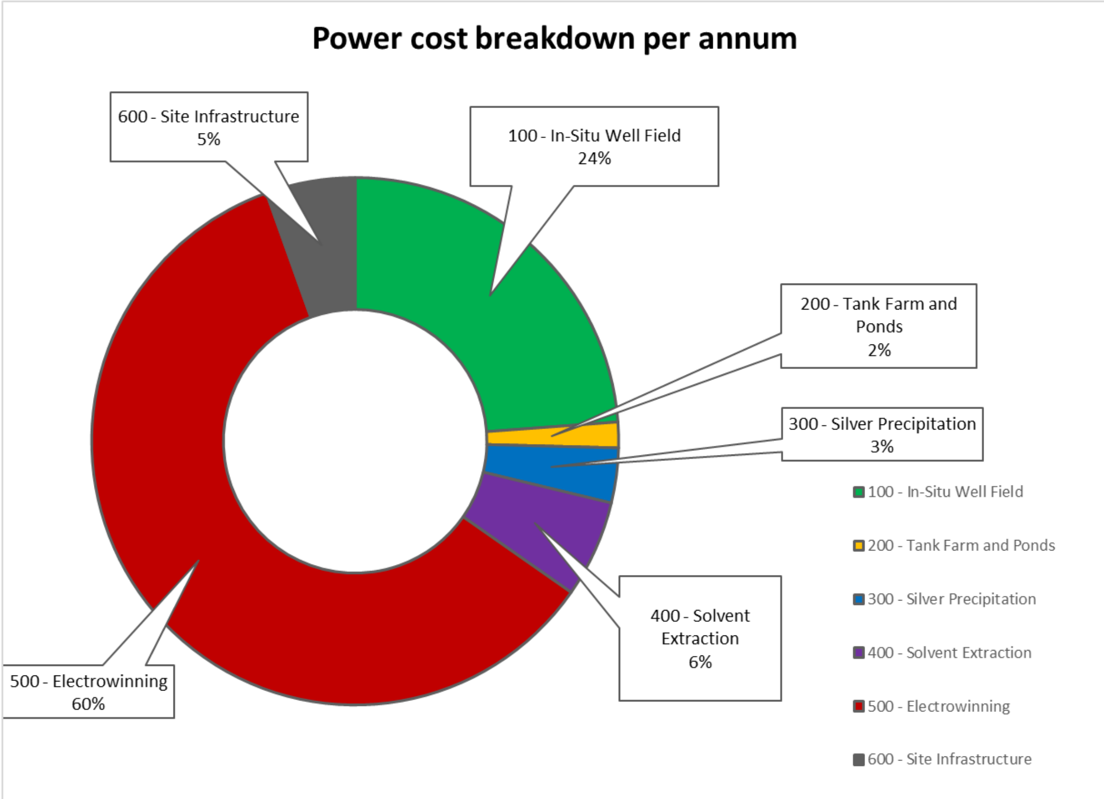

Figure 13-6 Stage 2 Power Cost Breakdown

13.4.5 Maintenance Costs

The maintenance cost is calculated based on a percentage of the equipment cost. It has been assumed maintenance cost for this project will be 6% of equipment costs due to the acidic conditions of the process.

13.4.6 G & A Costs

The models' G & A cost has been used to capture items that fall outside the above cost categories. These costs include the following for stage 1 of the project:

- Medical clinic labour/equipment/medicines costs assumed $200,000 p.a.
- Camp management/catering/ housekeeping costs assumed based on AUD80/person/day.
- Communication Costs assumed at AUD200,000 p.a.

- Laboratory cost assumed at AUD200,000 p.a.
- Mobile Equipment Lease. Assumed contingency cost of AUD200,000 p.a.
- Security requirements for the site and camp. Assumed fixed cost of AUD500,000 p.a.

Due to the expansion of the project, stage 2 additional cost have been considered were appropriate for the camp management, communication, laboratory and mobile equipment lease:

- Camp management/catering/ housekeeping costs assumed based on AUD80/person/day.
- Communication Costs assumed at AUD400,000 p.a.
- Laboratory cost assumed at AUD400,000 p.a.
- Mobile Equipment Lease. Assumed contingency cost of AUD400,000 p.a.
- Security requirements for the site and camp. Assumed fixed cost of AUD500,000 p.a.

13.4.7 Water Treatment Costs

The total water treatment cost is the sum of costs from water treatment facilities and activities, including the water treatment plant. It is assumed to be AUD2M p.a. and AUD20M for stage 1 and 2 respectively based on similar ISCR projects.

14. MARKETING

14.1 Marketing Overview

The objective of this market section is to:

- Identify the target markets and customers for the products
- Determine the likely market price for the products
- Consider target sales in the context of global market supply and demand
- Identify opportunities and challenges associated with marketing, sales and production.

It is anticipated that the project will produce three (3) products, these include:

- Copper Metal LME Grade
- Copper Sulphate Pentahydrate
- Silver Metal

The copper recovered from in-situ recovery can either be used to form copper metal of LME grade from electrowinning or copper sulphate pentahydrate from crystallisation. The distribution ratio will be determined and adjusted based on the market demand of each to achieve maximum revenue. Additionally, silver metal is foreseen as a potential byproduct based on current test work results that indicate potential for co-leaching of the silver with the copper.

Monetary figures in this section are reported in United States Dollars (USD) and Australian Dollars (AUD).

14.1.1 Copper LME Grade Market

Use and Consumption

Copper is the third most widely used metal on the planet. The metal is used for a variety of purposes including for copper tubing and electrical wiring, due to its high conductivity. For this reason, more than half the world's copper is used in electrical motors, wiring or generally in anything that requires electricity. It is particularly used in producing wind turbines, solar panels and storage applications including the necessary transmission wires to connect the renewable energy systems to the grid. Renewable energy systems use about twelve times more refined copper than traditional energy practices. The metal is popularly used in the electric vehicle market where more is used when compared to internal combustion engine vehicles (ICE). ICE vehicles utilise about 20 kg of copper in contrast to hybrids EV’s which utilise 50-55 kg, increasing up to 80 kg for fully powered EV’s.

Additionally, copper is used in metal alloys such as brass and bronze which are stronger and more corrosion resistant than pure copper. Copper is easily moulded so it is often added to precious metals to improve their elasticity, flexibility, hardness, and colour. Copper alloys have specific colours, ranging from the salmon pink of copper through yellow, gold and green to dark bronze in weathered conditions. Due to these properties copper and its alloys are used to make coins, jewellery and ornaments. Copper is increasingly being used in medical environments by installing copper touch surfaces like building rails, doorknobs and beds to halt the spread of bacterial infections due to its ability to kill various germs on contact.

There are four primary grades of commercial copper grades on the market namely, Grade A (LME grade copper) B, C, and D, also known as Grade 1 through to 4. They are all usable for a variety of applications, but each has its own set of characteristics that make it ideal for specific tasks.

- Grade 1 (A) Copper is the highest quality copper. It's 99.995% pure and is used in electrical applications where high conductivity is required. This is the objective for production of copper from the tank house at the Cobre project due to the premium price paid for the product
- Grade 2 (B) Copper is 99% pure and is used in applications where a higher level of ductility is needed.
- Grade 3 (C) Copper is 97% pure and is used in general engineering applications.
- Grade 4 (D) Copper is 95% pure and is the most common type of commercial copper.

Asia, Europe and the USA are the main global consumers of copper. China has particularly seen a large and consistent increase in copper consumption due to urbanisation and strong economic growth. This usage has been consistent in recent years. Figure 14-1 shows the copper usage trend in 2022 by region.

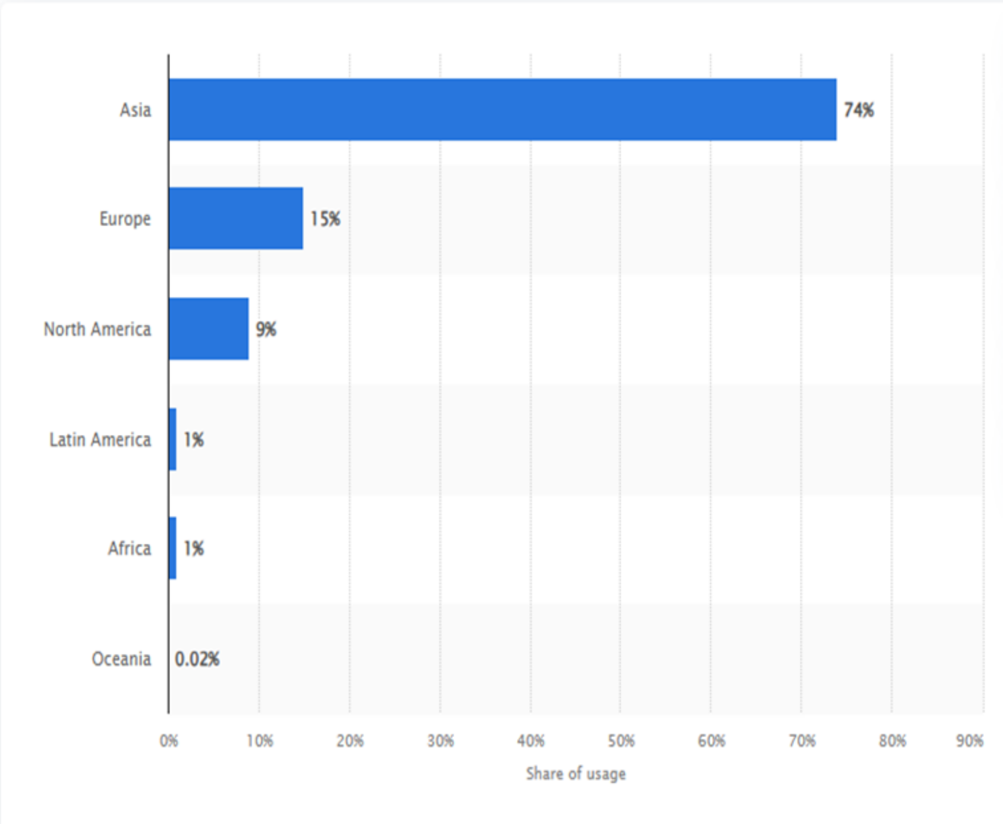

Figure 14-1 2022 Copper Usage Distribution by Region (statisa.com)

Figure 14-2 shows the global refined copper usage from 2010 to 2022.The data shows a general trend of increased copper usage throughout the years.

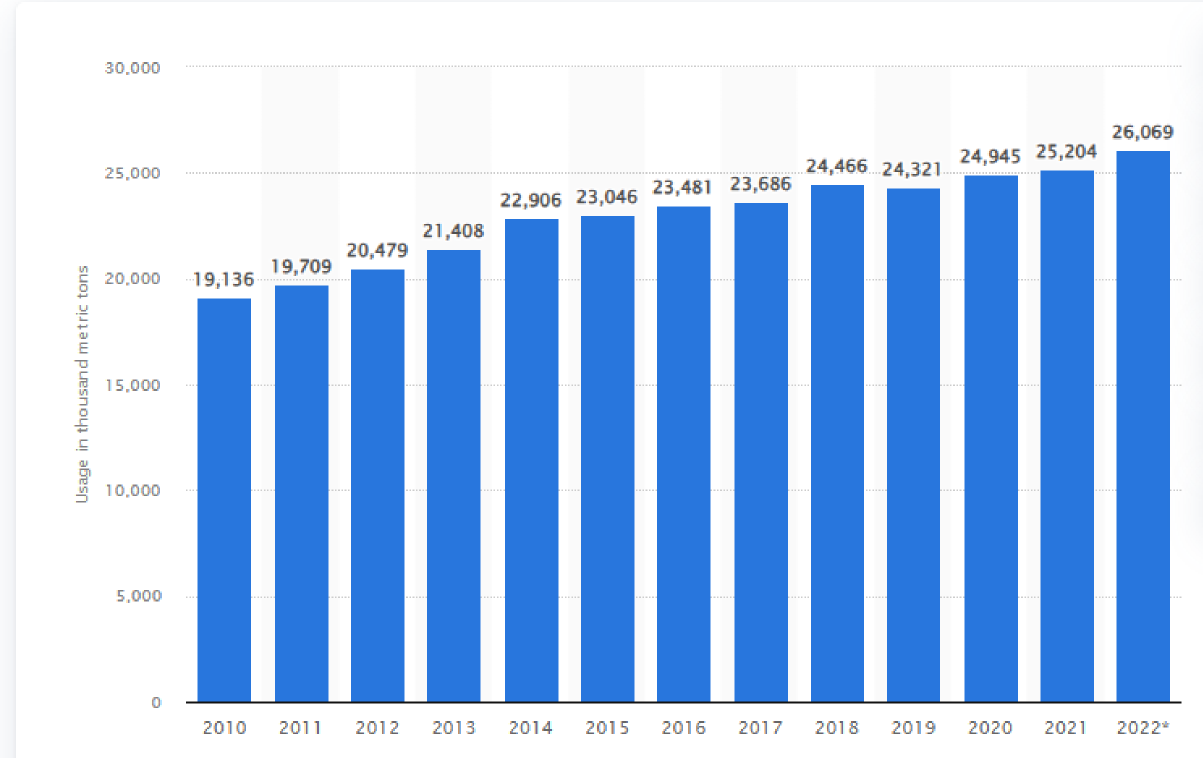

Figure 14-2 Global Refined Copper Usage 2010 -2022 (statisa.com)

Supply and Demand

Due to copper's diverse properties its applications are broad and prominent. As a result, its demand has always been high and continues to rise due to urbanisation and electrification. Its demand is predicted to double by 2035 mainly because of the ongoing energy transition to renewable energy sources which depends on the metal. Figure 14-3 shows past and predicted copper demand based on usage categories between the 2008-2050 period.

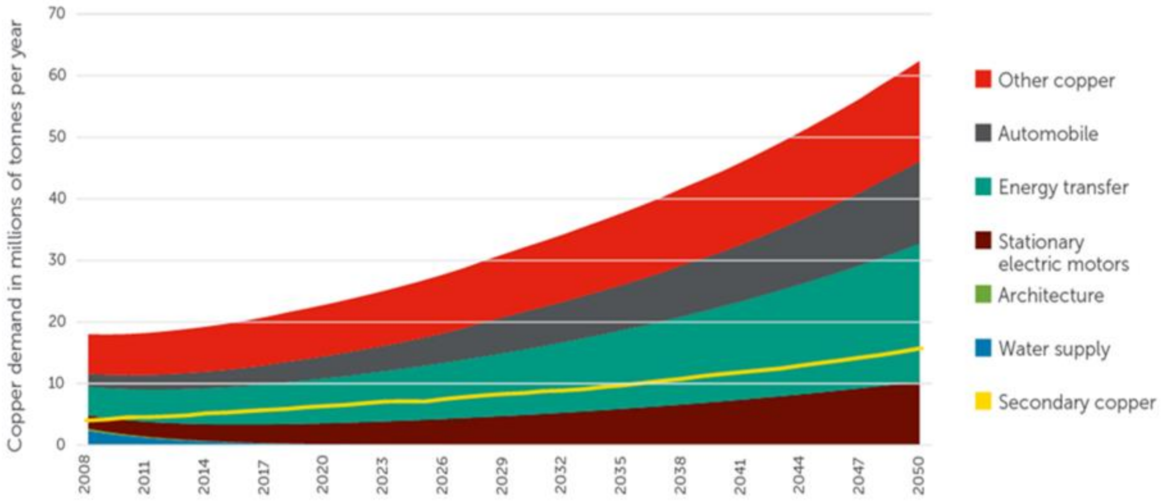

Figure 14-3 Copper Consumption Forecast 2008-2050 (Fraunhofer ISL ,Copper for future technologies)

Asia comprises an increasing share of global copper demand due to infrastructure growth with China currently accounting for over half the copper demand. There are occasional concerns regarding the copper market because it is closely linked to China's economy, but copper usage and demand are predicted to continue growing despite this link. Figure 14-4 shows copper demand by region between 2018 to 2030.

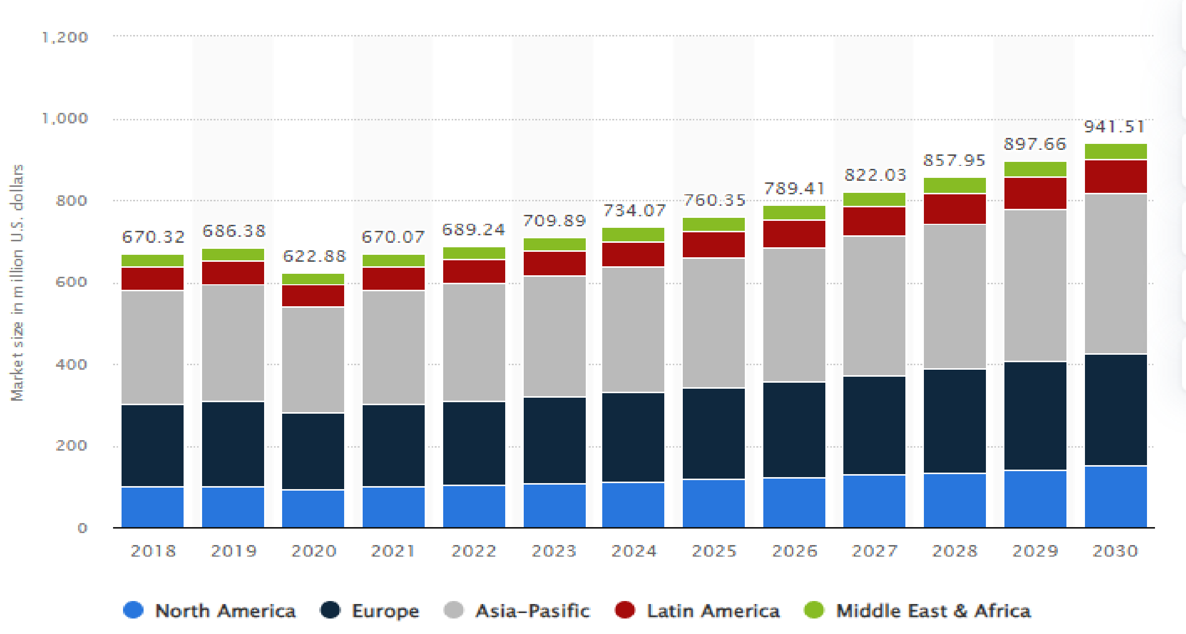

Figure 14-4 Copper Demand by Region 2019 (businessinsider.com)

The world's leading copper producing countries include Chile, Peru, and the Democratic Republic of Congo. Chile produces nearly one quarter of the world's copper and is also the country with the largest copper reserves. Escondida, located in the Atacama Desert in

Northern Chile, owned by BHP, is the world's largest copper mine based on its total copper reserves, its production capacity, as well as its actual copper output. Based on 2023 production figures, the world's largest copper miner is the U.S. mining company, Freeport McMoRan with production exceeding two million tonnes. The second-largest worldwide copper producer with approximately 1.39 million tonnes in 2023, is BHP. African countries are rapidly increasing their production with the Democratic Republic of Congo, transitioning from being a secondary copper producer in the late 1990s to becoming the third largest producer in 2023.

Table 14-1 shows the top copper producers in 2023.

Table 14-1 Top Copper Producers in 2023 (visualcapitalist.com)

Country	Region	2023E Production(million tonnes)
Chile	South America	5.0
Peru	South America	2.6
Congo(Kinshasa)	Africa	2.5
China	Asia	1.7
United States	North America	1.1
Russia	Europe/Asia	0.9
Australia	Oceania	0.8
Indonesia	Asia	0.8
Zambia	Africa	0.8
Mexico	North America	0.7
Kazakhstan	Asia	0.6
Canada	North America	0.5
Poland	Europe	0.4
Rest of the World	-	3.1
World total	**-**	**21.5**

For several years experts have been predicting a global copper deficit due to an uneven balance between copper's supply and demand.The supply deficit will mostly be caused by the exhaustion of current copper resources and the lack of enough copper projetcs to sustain the metals demand. Figure 13-5 shows the looming copper supply crunch predicted.

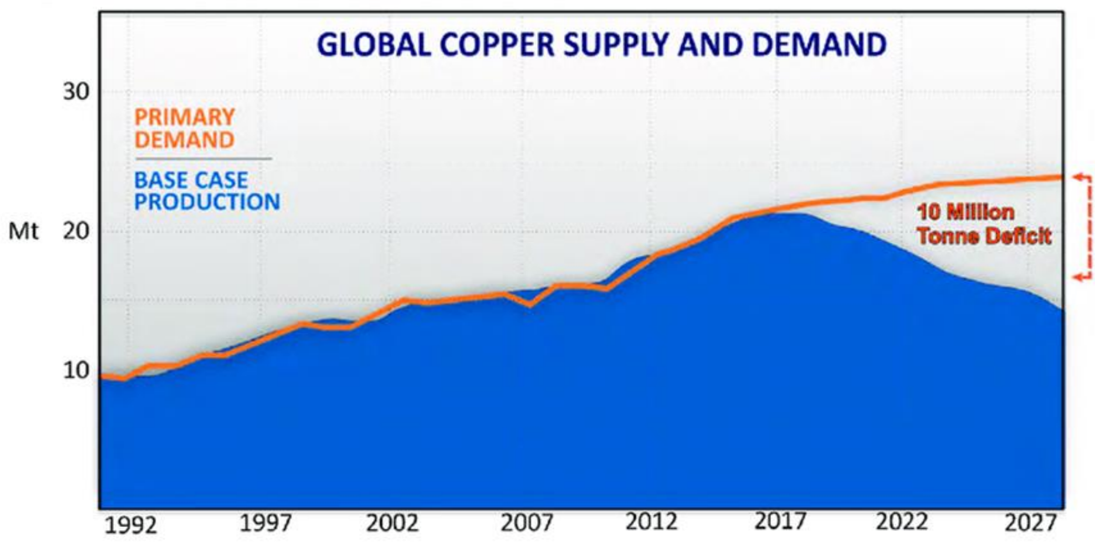

Figure 14-5 Global Copper Supply and Demand Balance (researchgate.com)

Price

Copper prices have remained relatively stable over the last decade (on an annual average price basis), reaching a record high in 2021. Figure 14-6 shows the copper price trend for the 2021-2024 period. The price of copper is largely influenced by the health of the global economy. Generally a rising market price suggests strong economic growth, while a decline suggests the opposite. Copper prices are mainly affected by technological innovations, industrial demand, international relations and supply. Essentially the copper price is directly affected by a shift, no matter how small, in demand from the leading consumers. Copper supply disruptions like political, enivironmental and labor issues have a big influence on the copper price. For example, labour strikes produce supply disruptions that lead to increased copper prices. Substituting the metal with cheaper metals like aluminum will decrease its demand and in turn its price.Global inflation is set to fall by the end of 2024 and bank interest rates are predicted to be cut which will ease downward market pressures and result in the raise of the copper price. Copper is expected to reach USD 12,000/t by the end of 2024 and increase to USD 15,000/t in 2025. It is important to note that a sudden halt of growth in emerging economies would have a negative effect on copper prices.

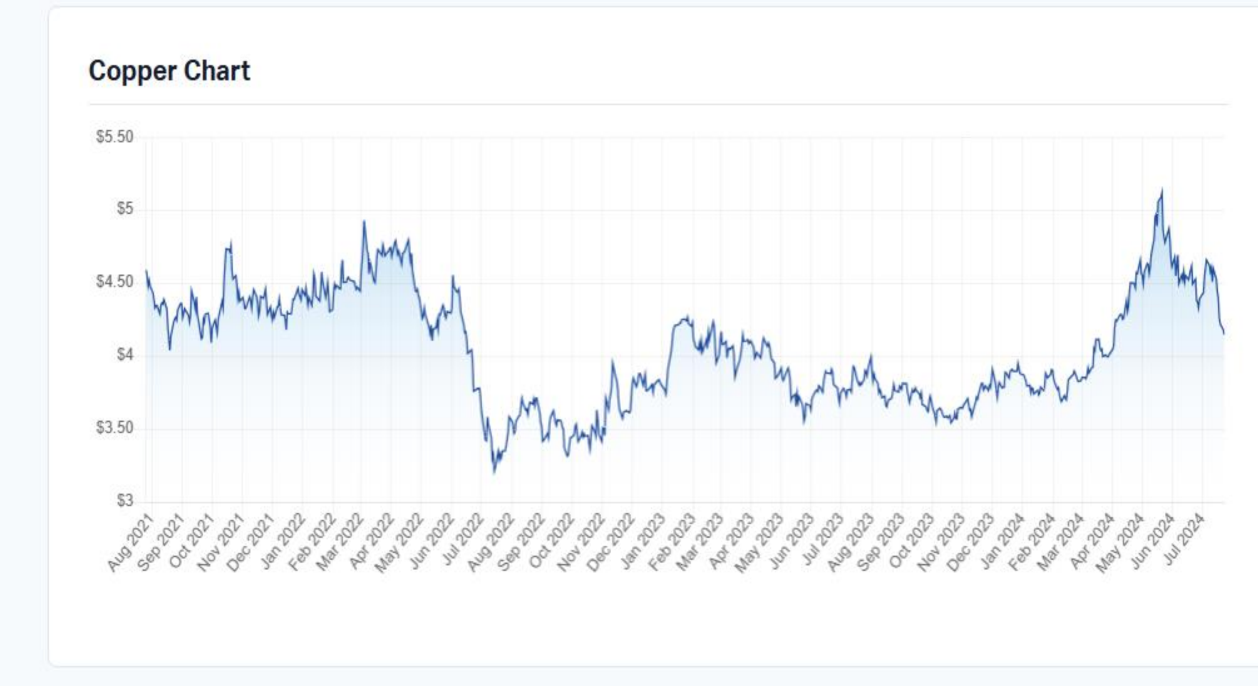

Figure 14-6 : Copper Price USD (marketindex.com)

Growth Opportunities and Challenges

As demand increases and prices shift, cheaper, faster to produce and more sustainable materials are being developed and used to replace copper in certain industries. Cheaper metals such as aluminium are being used as a substitute for copper in power cables, electrical and refrigeration equipment. To meet high development needs and promote recycling the use of copper scrap is being encouraged and proving to be successful in most industries.

The rapid growth in the renewable energy sector across the globe presents a substantial growth opportunity in the upcoming years. Since renewable technologies such as wind and solar widely rely on refined copper for enhanced energy transmission and utilisation it will continue to be an essential resource. In 2022, the global refined copper market was valued at USD 237.6 billion, and it is projected to reach USD 368.9 billion by 2032. Between 2023 and 2032, the market is estimated to register the highest compound annual growth rate (CAGR) of 4.5% as illustrated in Figure 13-7.

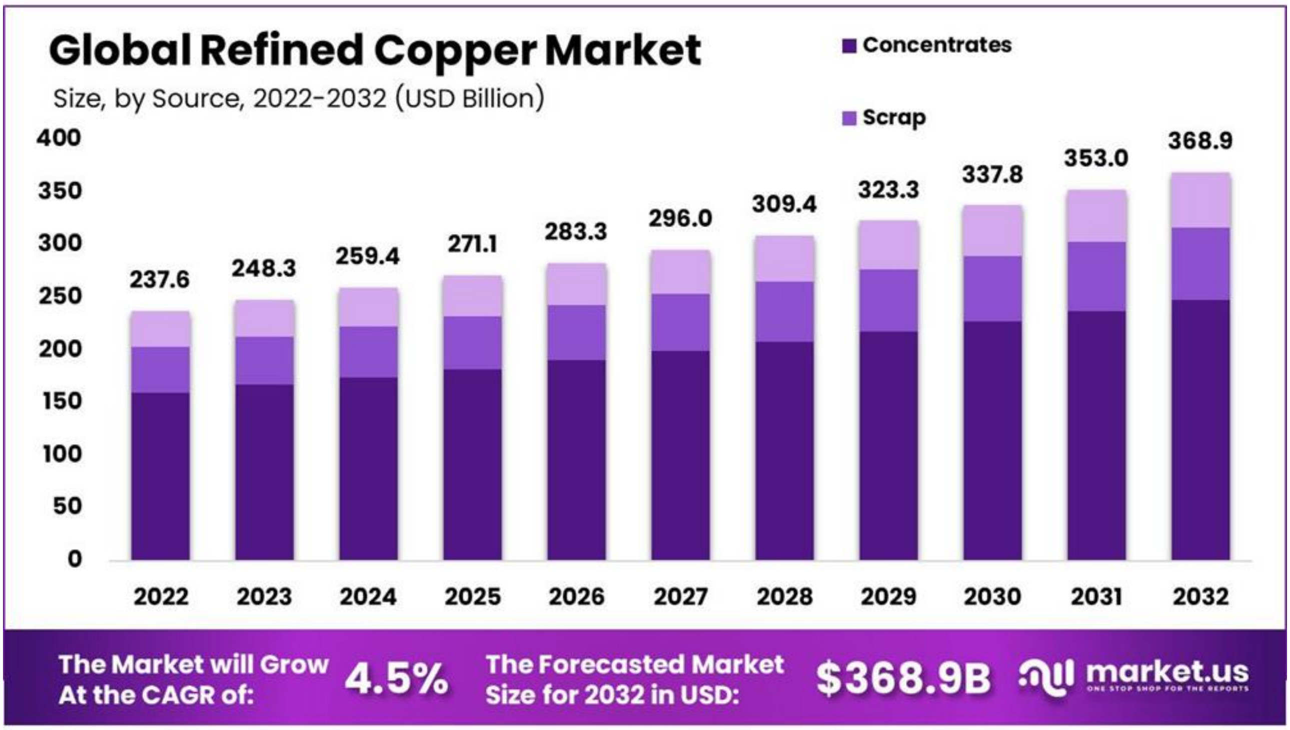

Figure 14-7 Copper Market Growth Forecast(market.us)

14.1.2 Copper Sulphate Market

Uses

Copper sulphate is sold as a blue powder when the crystals are crushed and dried. It consists of 25.47% copper, 38.47% sulphate and 36.06% water by mass. Copper sulphate is used in multiple industries such as mining, chemical, pharmaceutical, healthcare, and agriculture. In the healthcare sector, it is used in sterilisers and disinfectants. Industrial usage involves the building, chemical, and textiles industries, where it is used to manufacture products like adhesives insecticides, wood preservatives and paints.

Around 200,000 tonnes of copper sulphate are thought to be consumed globally each year, with the agricultural sector using most of it. The production of fungicides and insecticides used in farming to increase crop output uses copper sulphate as a basic ingredient. It is also used in herbicides or fungicides to control fungus in orchards for grapes, melons, berries and vegetables. When copper is sufficient in the soil, plants become more resistant to diseases and pests, and the plants themselves inhibit the development of fungal diseases, resulting in a higher yield of fruits and seeds.

Copper sulphate is also used as a fertiliser. It increases pollen viability, promotes the formation of reproductive organs and the accumulation of sugars, reduces crop wilting and increases plant resistance to fungal and bacterial diseases. Since global food consumption has increased due to the growing population, farmers are utilising more productive farming methods. It is also used in swimming pools to prevent algae. Most algae can be killed with very low concentrations of copper sulphate. Even though it inhibits the growth of some bacteria, for example Escherichia coli, it is used in aquariums to treat fish for parasitic infections or to kill aquarium snails.

In the construction industry, copper sulphate is added to concrete to improve its absorption of water and to impart disinfecting properties. It can also be used to remove rust and salt deposits from surfaces of concrete, brick, plaster, and clinker. Wood is impregnated with copper sulphate to prevent rotting, mould growth, and wood fungus.

In veterinary medicine, copper sulphate is used for the prevention and treatment of hoof diseases by preparing copper sulphate solution baths for animals. It is also used in feed additives and premixes as a source of copper mineral. Concentrations used range up to 0.2-0.3% by weight of the premix.

Figure 14-8 shows the distribution of the copper sulphate market by industrial usage.

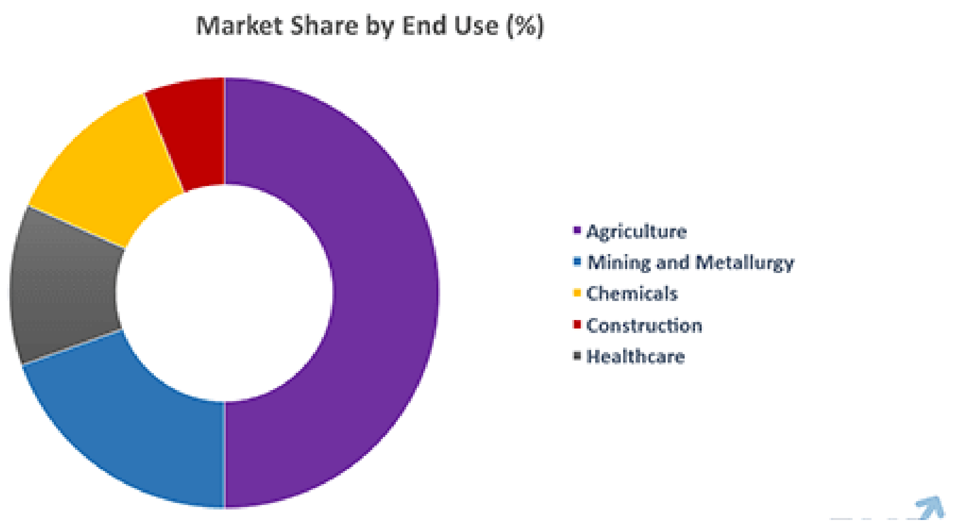

Figure 14-8 Global Copper Sulphate Market Share by Use (expertmarketresearch.com)

Supply and Demand

Due to copper sulphate's various and diverse uses it can be marketed and sold globally. The demand for copper sulphate is generally high and mostly consistent due to this reason. China, Japan, South Korea, Taiwan, and India are the top five consumers of copper sulphate. These countries makeup 61% of the world's copper market which ultimately means that the copper sulphate market is driven by rising copper production and demand.

The Asia-Pacific region is the biggest consumer of copper sulphate mostly due to the presence of large agricultural and animal husbandry industries. The continuous rise in Asia's agricultural sector will result in a higher increase in the demand of copper sulphate. However, the demand from the agriculture industry is occasionally limited and lulled during agricultural off seasons. Other major consumers are the Americas and Europe. The main copper sulphate importer is listed as the United States holding one fifth of the market, valued at AUD 120 billion in 2022.Figure 14-9 shows the leading copper sulphate importers worldwide in 2021.

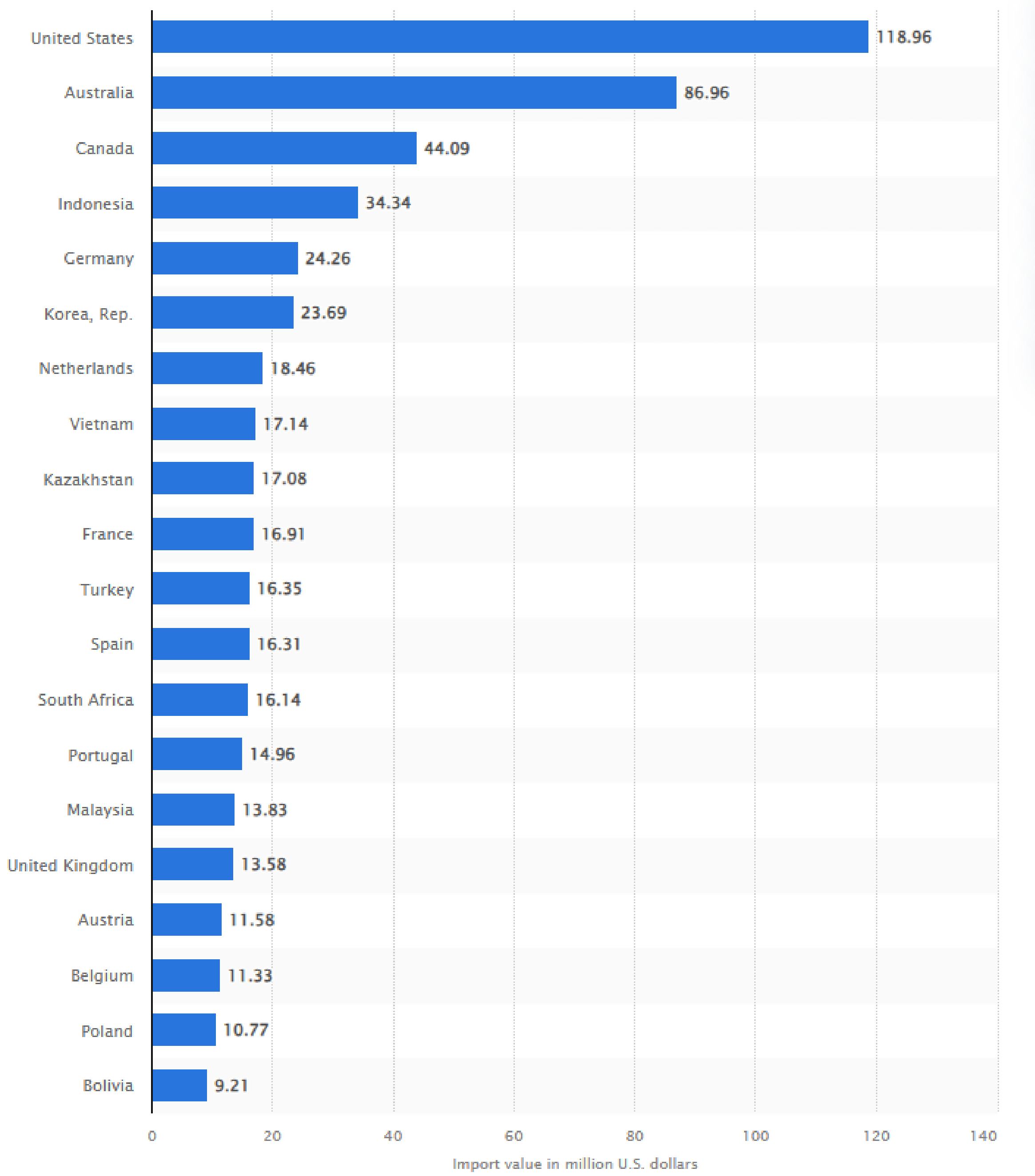

Figure 14-9 Leading Copper Sulphate Importing Countries 2021 (statista)

The Canadian copper sulphate market has the fastest growing market in the North America region. It is experiencing a current consistent upward trend due to high demand across various downstream sectors and increased import prices from key exporting regions. There has also been an increase in the use of copper sulphate in household activities due to its increased use for water treatment. Hence demand in this region is projected to continue experiencing growth.

The prominent companies in the copper sulphate industry are Atotech in Germany, Noah Chemicals in USA, Wego Chemical Group in USA and Allan Chemical Corporation in USA. These companies are the main suppliers and distributors of the product globally. South Africa, Russia, Turkey and Chinese Taipei are the top exporters of copper sulphate. Figure 14-10 shows the top copper sulphate exporters by country.

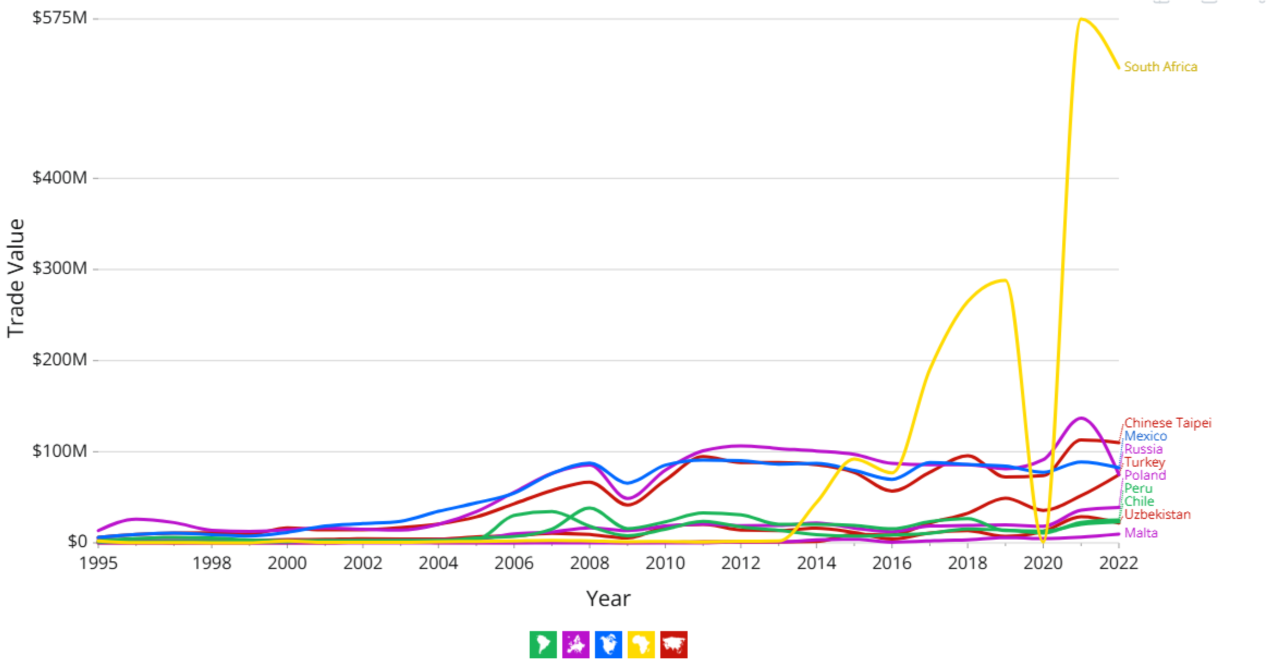

Figure 14-10 Top 10 Copper Sulphate Exporters by Total Exports Percentage (oec.world)

Copper Sulphate Grades

The market size of the Copper Sulphate Pentahydrate Market is generally categorised based on type (Feed Grade, Electroplating Grade, Industrial Grade, Flotation Grade), application (Electronics Industry, Agriculture Industry, Chemical & Material Industry) and geographical regions (North America, Europe, Asia-Pacific, South America, and Middle East and Africa).

Table 14-2 shows the grade specifications.

1.Feed Grade: Used for feed additive to stimulate the growth of pigs and broiler chickens etc.

2. Industrial Grade: Used for textile mordant, tanning leather, electroplating industrial, mining industrial, preservative of wood etc

3. Agriculture Grade: Widely used in agriculture as fertiliser, fungicides, insecticides etc.

Table 14-2 Copper Sulphate Grades

Grade item		Industrial grade	Feed grade	Electroplating grade
$CuSO_4$ $5H_2O$	%≥	98	98.5	99
Cu	%≥	25	25.1	25.2

H_2SO_4	%≤	0.2	0.2	0.2
Water insoluble	%≤	0.2	0.2	0.1
Pb	≤	10 ppm	10 ppm	10 ppm
As	≤	5p pm	4 ppm	5 ppm

Copper sulphate produced in accordance with GOST (19347-84) is available in grades A first grade, B first grade and B second grade. It must comply with some standards in terms of physico-chemical indicators which are shown in Table 14-3.

Table 14-3 Copper Sulphate Standards (lerochem.eu)

Name of Indicator		Types			
		A		B	
		Highest	First	1 type	2 type
1	Percentage by weight of copper sulphate converted to $CuS_4 \cdot 5H_2O$	≥ 99.1	≥ 98.0	≥ 95.0	≥ 93.0
	Percentage weight after conversion to copper	25.20	24.94	24.17	23.67
2	Percentage weight of iron content	≤ 0.02	≤ 0.04	≤ 0.03	≤ 0.10
3	Percentage by weight of free sulphuric acid	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.30
4	Percentage by mass of water insoluble precipitate	≤ 0.03	≤ 0.05	≤ 0.04	≤ 0.10
5	Percentage mass fraction of arsenic	≤ 0.0002	≤ 0.012	≤ 0.012	≤ 0.03

Price

The prices of copper sulphate pentahydrate vary depending on the cost of production and packaging. Different regions generally price their product differently. High purity copper sulphate usually has a 25% premium price based on the copper content in the sulphate.

Copper sulphate demand and prices in North America are generally affected by seasonal factors. Prices tend to increase during summer due to increase in water-based activities and agriculture. The pricing environment is currently positive with strong indications of continued demand growth and price resilience despite challenges from plant shutdowns and logistical disruptions.

The Asia pacific region's overall copper sulphate market has been experiencing demand challenges due to adverse weather conditions that have affected consumption in downstream industries. This combined with the oversupply of the product and disruptions in the supply chain has created a negative pricing environment.

Moreover, the European market has been experiencing a consistent decline in prices due to multiple factors; decrease in demand in downstream sectors such as agriculture and construction, supply chain disruptions, temporary closure of major production facilities (like the Don Chemical Plant), USD against Euro inflation and market oversupply.

Table 14-4shows the copper sulphate prices by region for the quarter ending June 2024.

Table 14-4 Copper Sulphate Prices Q2

Region	Price (USD)/t
North America	2250
APAC	1950
Europe	2159

Growth Opportunities and Challenges

Due to copper sulphate having negative effects when ingested the market might face some challenges and limitations by the development of safer and equally effective substitutions. Moreover, the adoption of sustainable methods and developments in production technologies targeted at improving product purity might also lead to the isolation of copper sulphate. For example, strict laws governing the use of copper in animal feed are being practiced in certain areas.

Despite these negatives a high market growth rate is anticipated for the global copper sulphate market. This is aided by factors like the rising demand for copper sulphate in the agricultural sector, particularly in the production of fungicides and as an ingredient in animal feed as the human population continues to rise. Additionally, copper sulphate is the most preferred electrolyte in the metal and electrical industries for uses like refining, electroplating, and battery development. The copper sulphate market is generally predicted to continue to grow due to its multiple uses. The copper sulphate market is projected to grow from AUD 1.3 billion in 2023 to AUD 2.0 billion by 2032, exhibiting a compound annual growth rate (CAGR) of 5.80% during the forecast period of 2023 to 2032.The past and forecasted Copper Sulphate Market values are shown in Figure 13-8.

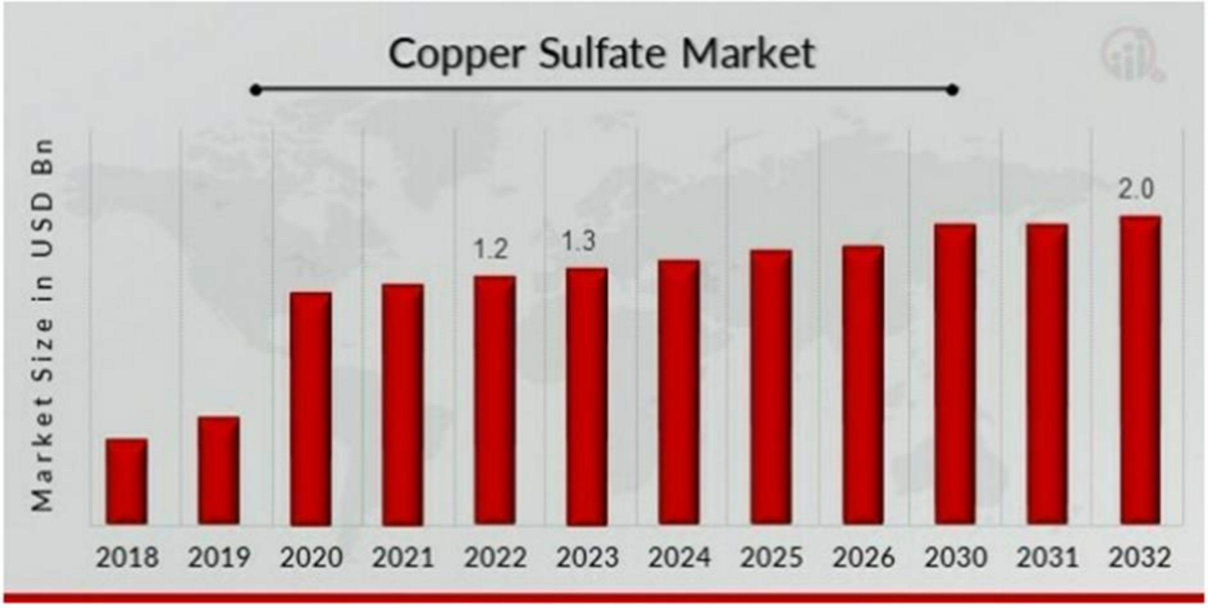

Figure 14-11 Copper Sulphate Pentahydrate Market Size(marketresearchfuture.com)

14.1.3 Silver Market

Use and Consumption

Silver is one of the precious metals together with gold and the platinum group metals. It's malleable and ductile, making it perfect for jewellery, coins and ornaments. Because it is one of the world's most reflective substances, silver has a uniquely beautiful shine. Silver has the highest known electrical and thermal conductivity of all metals due to its unique crystal structure and single valence electron. This allows it to be used in electronic components such as wires, switches and printed circuit boards. The combination of ductility and electrical conductivity makes silver perfect for micro-electronics devices such as smartphones, where it can be bent and squeezed into tiny spaces without breaking. Silver also exhibits the unique property of penetrating bacteria cell walls – while not harming mammalian cells – and destroying the ability of the microbe to reproduce. This allows silver ions to be employed as a biocide, which is growing increasingly important as overuse of chemical antibiotics is causing some bacteria to become immune. Due to its diverse uses silver is used in various industries across the world with United States of America, China and Japan leading consumption annually. Figure 14-12 shows the leading silver consumers worldwide in 2010.

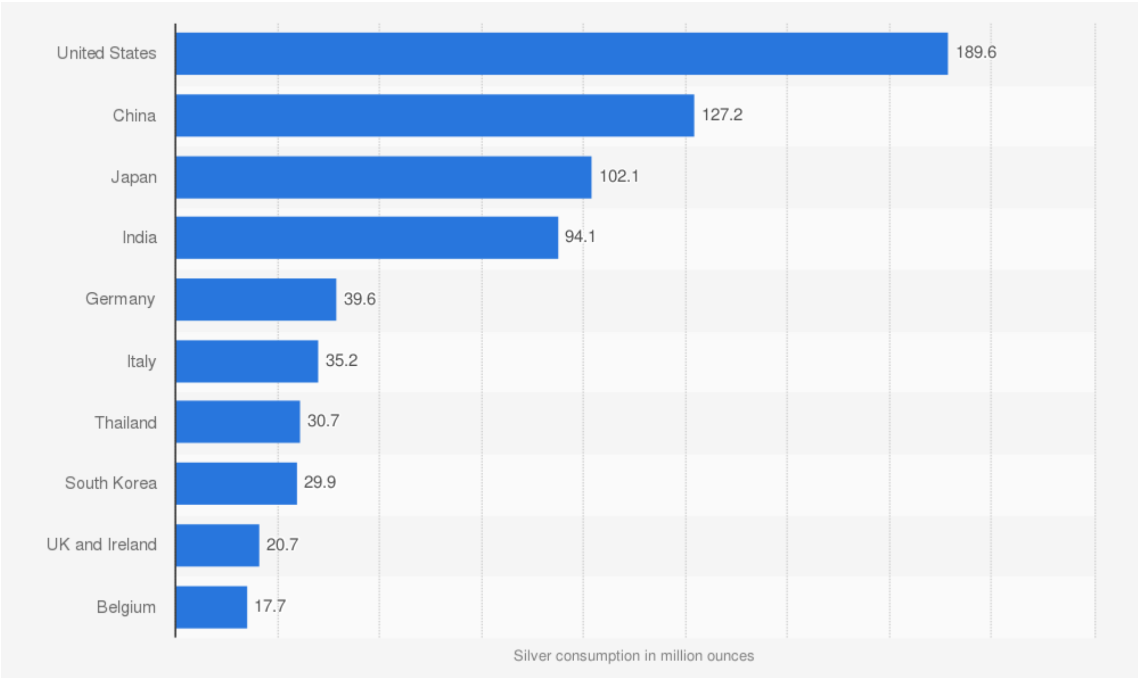

Figure 14-12 Leading Silver Consumers Worldwide in 2010

Supply and Demand

Most global estimates put world production of silver at averaging 20,000 tonnes per year. The majority of silver is produced as a by-product of base-metal mining. As much as 60% of new silver comes from mines extracting lead, zinc, and copper. Another 10-15% gets dug up during gold extraction. Only 20-25% of silver comes from primary silver mines. Figure 14-13 shows production of the leading primary silver mines in 2023.

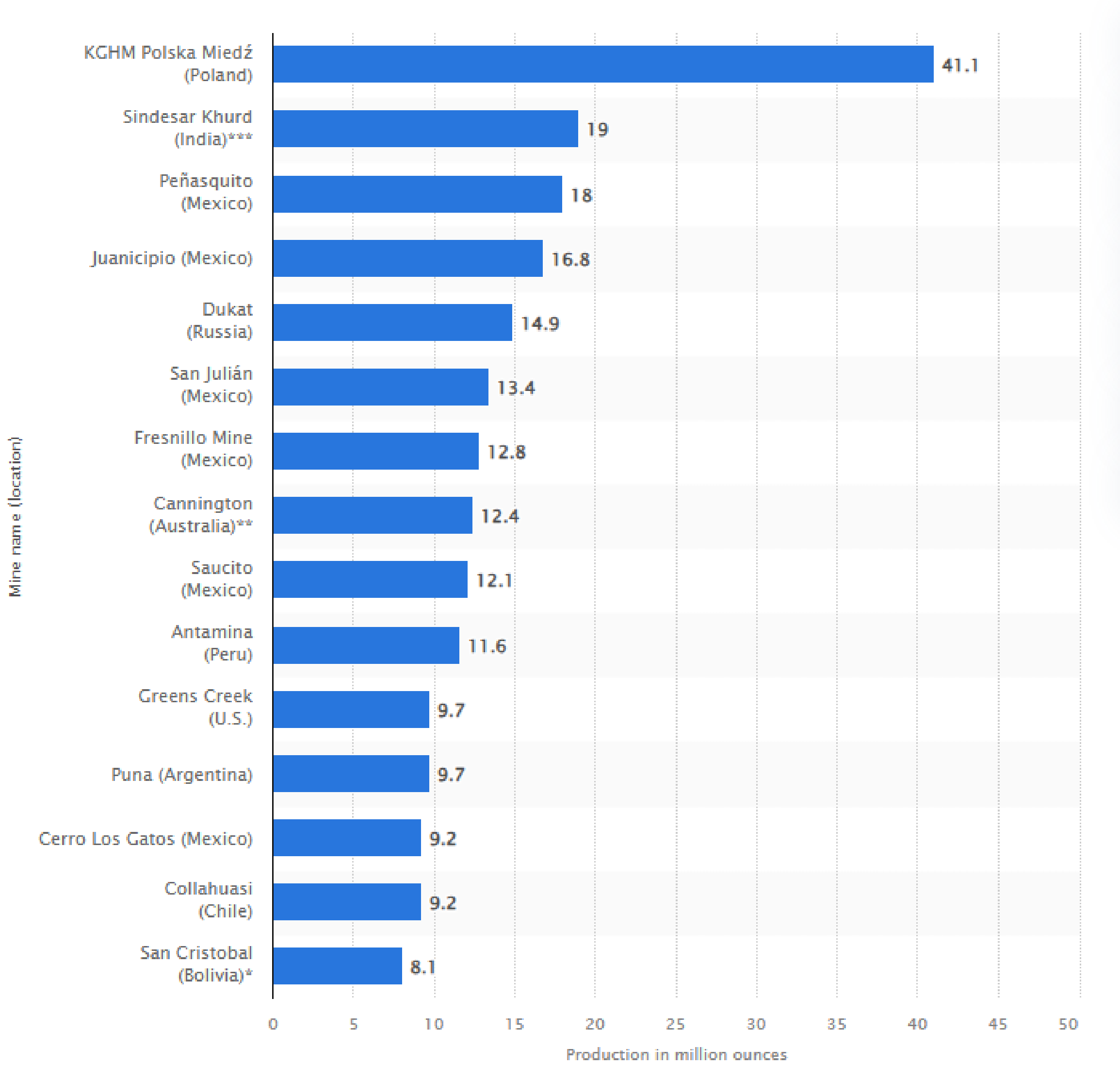

Figure 14-13 Leading primary silver mines worldwide in 2023

In 2023, production from primary silver mines decreased slightly, by 0.6% year over year. However, despite some mines being suspended due to low base metal prices, the output of silver by-products from lead-zinc operations increased by 1% year over year. The rise in productivity and the start-up of additional operations led to a 3.9% year-over-year increase in silver obtained from copper operations. Primary gold mine output decreased by 12.2% year over year, with cuts in production at Newmont's Peñasquito mine in Mexico, being a contributing factor. Table 14-5 and Figure 14-14 show the silver production distribution by metal.

Table 14-5 2023 Silver Mine Production by Source Metal (silver institute.org)

Million ounces	Lead/Zinc	Silver	Copper	Gold	Other
North America	38.9	147.0	12.4	42.8	0.3
Central & South America	73.6	41.4	85.8	39.7	0.0
Europe	12.4	1.5	51.1	1.7	0.0
Africa	3.4	6.8	4.7	3.1	0.0
CIS	11.2	16.5	28.1	11.2	2.4
Asia	102.2	7.6	35.0	9.1	1.5
Oceania	14.1	14.4	4.3	6.1	0.0
Total	**255.8**	**235.2**	**221.4**	**113.8**	**4.2**

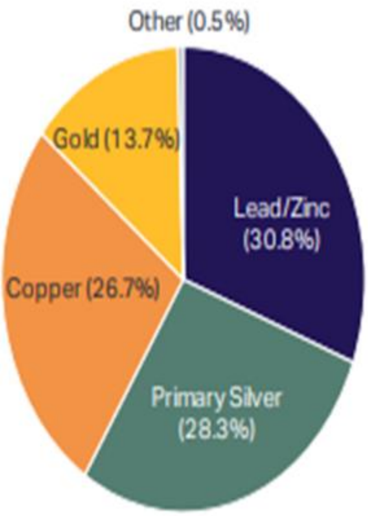

Figure 14-14 2023 Silver Mine Production by Source Metal (silver institute.org)

The top 10 silver-producing countries; Mexico, China, Peru, Chile, Australia, Poland, Bolivia, Russia, the United States, and Argentina produce a major portion of the world's silver supply, with their mining industries playing an important role in the global economy. Mexico is the world's largest silver producer, accounting for about 20% of global production. China is the second-largest silver producer, accounting for about 15% of global production followed by Peru, the third-largest silver producer, accounting for about 10% of global production. Figure 14-15 shows the Global silver production between 2014 to 2024.

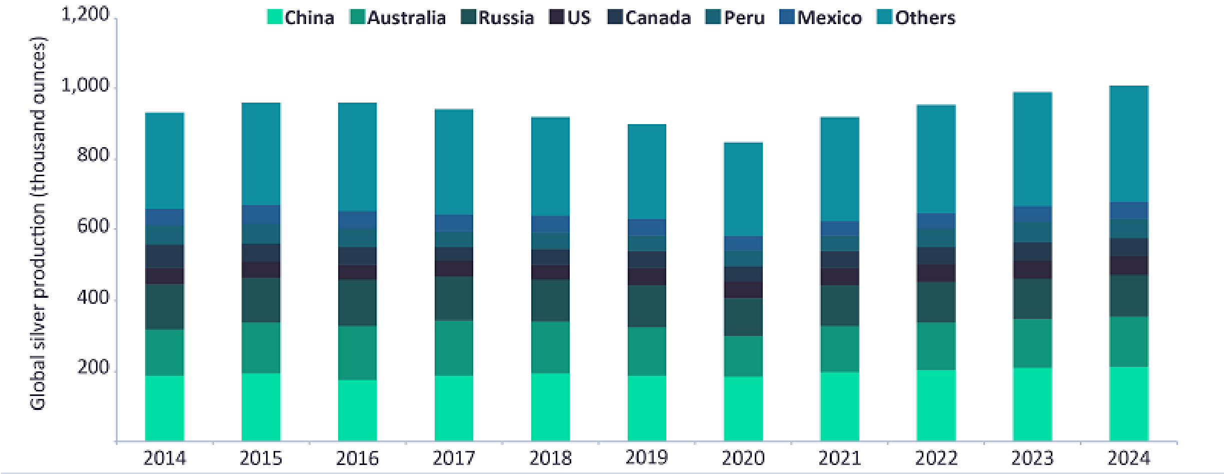

Figure 14-15 Global Silver Production Between 2014 to 2024 (globaldata.com)

Generally, for the past 4 years the demand for silver has outweighed the silver supply. The global silver deficit is anticipated to increase by 17%, reaching 215.3 million ounces in 2024. It is believed that this increase is the result of a 1% decrease in overall supply and a 2% increase in demand, mostly driven by strong industrial silver consumption. The change is also a result of supply chain problems, mine closures and production delays. Over the three-year period from 2021 to 2023, there has been approximately a cumulative deficit of 474 million ounces, which is equivalent to 14,743 tonnes of silver. Government initiatives and environmental concerns are driving an increasing demand for green infrastructure, which is driving up the demand of silver in the industrial sector relative to its supply. Table 14-6 and Table 14-7 show a summary of the silver supply and demand between the 2020 to 2024 period. The 2024 values in these days are forecasted end of 2024 values (2024F). Figure 14-16 shows the silver market balance during the 2014 - 2022 period.

Table 14-6 Silver Supply 2020 -2024 (silverinstitute)

Million ounces	2020	2021	2022	2023	2024F	2023	2024F
Supply							
Mine production	783.4	829.0	836.7	830.5	823.5	-1%	-1%
Recycling	164.3	173.7	176.9	178.6	178.9	1%	0%
Net hedging	8.5	0.0	0.0	0.0	0.0	NA	NA
Net official sector sales	1.2	1.5	1.7	1.6	1.5	-6%	-9%
Total Supply	**957.4**	**1,004.3**	**1,015.4**	**1,010.7**	**1,003.8**	**-0.5%**	**-1%**

Table 14-7 Silver demand 2020 -2024 (silverinstitute)

Million ounces	2020	2021	2022	2023	2024F	2023	2024F
Demand							
Industrial(total)	509.7	561.3	588.3	654.4	710.9	11%	9%
Electrical & electronics	322.0	351.2	371.3	445.1	485.6	20%	9%
Photovoltaics	82.8	88.9	118.1	193.5	232.0	64%	20%
Brazing alloys& solders	47.5	50.5	49.2	50.2	51.8	2%	3%
Other industrial	140.2	159.6	167.8	159.0	173.5	-5%	9%
Photography	26.9	27.7	27.5	27.0	26.1	-2%	-3%
Jewelry	150.9	182.0	234.5	203.1	211.3	-13%	4%
Silverware	31.2	40.7	73.5	55.2	58.8	-25%	7%
Net physical investment	208.1	284.3	337.1	243.1	212.0	-28%	13%
Net hedging demand	0.0	3.5	17.9	12.2	0.0	-32%	NA
Total Demand	**926.8**	**1,099.6**	**1,278.9**	**1,195.0**	**1,219.1**	**-7%**	**2%**

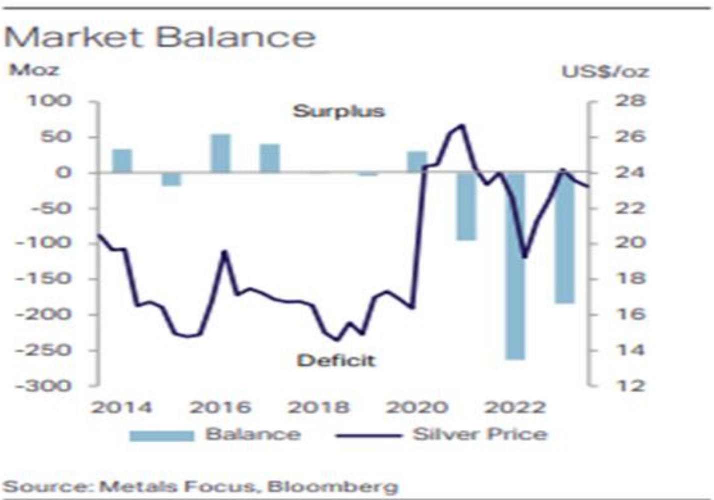

Figure 14-16 Market Balance (silverinstitute.org)

Price

Silver (Ag) is around 1/80 the price of gold. Demand for silver comes equally from both industrial and investment avenues. This balance implies that the price is directly impacted by the global economy's economic outlook. Silver price started in 2024 at USD 4.03. Table 14-8 shows silver price predictions made by silver investors for 2024 at the beginning of the year. Silver is expected to hit USD 30 by the end of 2024 and increase by approximately USD 10 per year reaching more than USD 110 by 2035. Table 14-9 shows the forecasted trend that the price of silver will take between the period of 2024 - 2035.

Table 14-8 Silver Predictions

Analyst/Firm	2024 Silver Price Prediction
InvestingHaven.com	$34.70 – $48.00 in 2024
JP Morgan	$30 in 2024
Commerzbank	$30 in 2024
CitiGroup	$30 in 2024
Heraeus Precious Metals	$22 – $29 in 2024
Robert Kiyosaki	$500 by end of 2024

Table 14-9 Forecasted Silver Price Trend 2024 -2035 (coinpriceforecast.com)

Year	Mid-Year USD	Year-End USD
2024	29.44	30.81
2025	34.13	40.03
2026	42.31	44.27
2027	47.59	51.91
2028	57.20	62.92
2029	68.58	74.19
2030	79.40	84.90
2031	90.36	95.78
2032	100.50	103.08
2033	103.36	108.26
2034	109.38	112.29

2035	113.05	117.47

Growth Opportunities and Challenges

Global silver mine production is expected to continuously grow in the 2024-2030 period. This is mostly due to the resumption and ramp up of operations that were temporarily halted due to operational disruptions at major mines. Moreover, new silver projects are expected to commence such as Terronera, EC120, Media Luna, and Tahuehueto which will boost production growth.

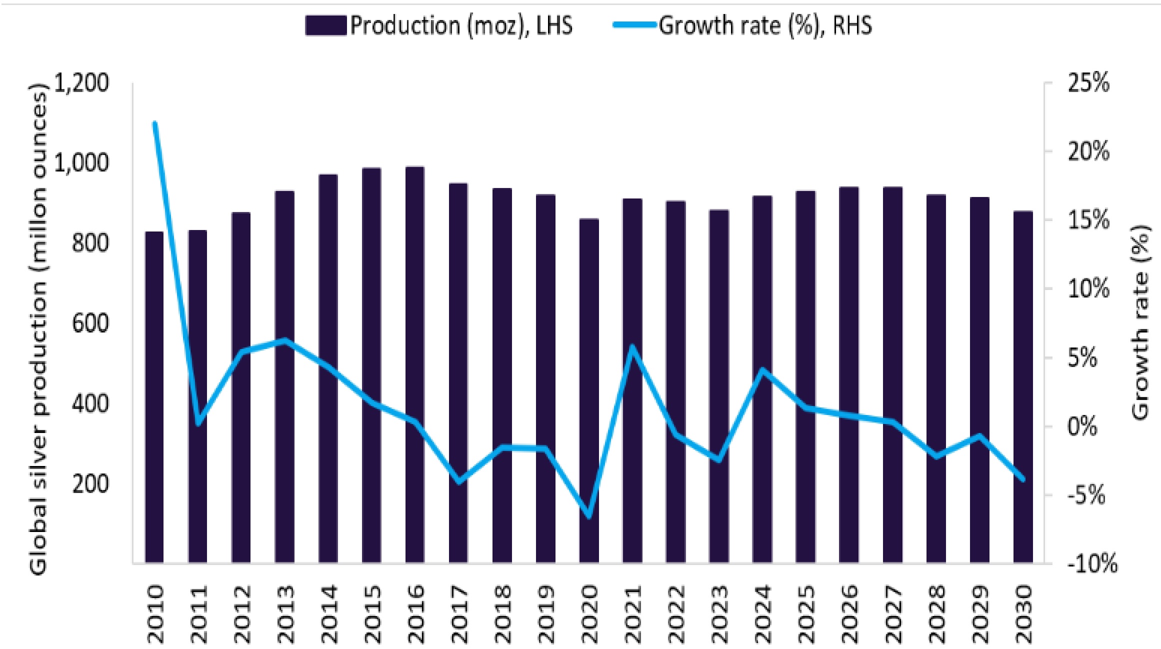

Figure 14-17 Global Silver Production Trends 2010-2030 (globaldata)

However, the silver deficit is predicted to continue regardless of the production growth. This is because of the limited availability of primary mines which make boosting silver supply a complex challenge. With around 80% of silver supply coming from polymetallic projects, where silver is a byproduct the supply-demand balance will always be uneven. Research and investigations for alternative cheaper technologies to substitute silver are global underway with the aim of reducing the silver demand. Unfortunately, due to the silver having the highest electrical and thermal conductivity it is proving impossible to find a suitable substitute. Hence, silver demand will remain high.

14.1.4 Conclusion

For evaluating the Cobre ISCR project, METS has relied on the following long-term prices for the products:

Table 14-10 COBRE Product Prices

Product	AUD	USD

LME Copper	6.62 / lb	4.30 / lb
Copper Sulphate	3,465 t	2250 t
Silver	46.2 / oz	30 / oz

15. ECONOMIC ANALYSIS

A comprehensive financial model and associated economic analysis was prepared for the Ngami Copper In-situ Recovery project. The financial model was divided into two stages to cover the project's life of 7 years. The first stage, operated at production of 4Mlb/a copper for 3 years before ramping up to stage 2, commissioning and operating at full scale to produce 40,000tpa of copper. The model also considers resources of different confidence over stage 2 indicated by stage 2a and 2b. Stage 2a will develop wellfield on higher grade resources first before proceeding to the larger resource.

Table 15-1 Project life summary

Stage	Operation Scale	Resource	Grade of Cu	Throughput	Time
1	Starter	2,803,150	0.59% (Inferred)	1,903 tpa	3 Years
2a	Full	20,557596	0.49% (High confidence drilling)	39,998 tpa	4 Years
2b	Full	111,000,000	0.40% (Wide spaced drilling)	39,998 tpa	

The financial model is conceptual and indicative in nature, which aims to provide economic assessment results based on estimates of the capital expenditures (CAPEX) and annual operating expenditures (OPEX) of the proposed plants. Necessary assumptions have been made and integrated into the overall project financial model. The complexity of an ISCR operation and process will mean that at this stage additional information is needed to refine this financial model further with consideration around a more detailed solution mining modelling process of the wellfield from data obtained from pilot ISCR testwork.

15.1 Financial Model Assumptions

The following assumptions have been made to generate the financial model for economic evaluation:

- Currency used for model is Australian Dollars (AUD)
- Commodity sale price for LME copper and silver are based on up-to-date reliable reports. See MARKETING section.
- Commodity sale price for copper sulphate with required purity is estimated based on up-to-date reliable online resources, where a conservative adjusting factor was applied on the price to offset difference in purity. See MARKETING section.

- Zero salvage or scrap value assumed as part of general worst-case scenario.
- Capital and Operating costs provided by METS
- Owner costs are considered in CAPEX model
- IRR and NPV calculated pre-tax
- A sustaining capital rate at 4% of the total capital cost estimation has been applied.
- Resource under leach per year is maintained at 1,315,750 tonnes for the first stage start production and 27,655,749 tonnes for the second stage full production.
- Wellfield capital to establish next production field is captured at $1,334,000 per year starting in year 2 under Wellfield Expansion Capital and increased to $ 26,834,000 for stage 2. Year 4 does not include this cost because it is covered in Year 3 under the main capital cost.
- Additional wellfield costs for additional production fields are captured at $644,124 starting in year 2 under Wellfield Maintenance. It is increased to $13,526,619.40 in Year 4 on expansion.
- Resource Grade assumed constant for stage 1 and is divided into two classes for stage 2 in the base case
- Recovery assumed constant for base case.

15.2 Base Model

15.2.1 Feed Material

The average feed grades for recoverable metal content as well as achieved recovery rates are summarized in Table 15-2 based on calculations for the project's mass balance:

Table 15-2 Average grades and recovery rates

	Stage 1	Stage 2a	Stage 2b	Recovery
Cu (%)	0.59%	0.49%	0.40%	36.2
Ag (g/t)	11.73 g/t	7.28 g/t	7.20 g/t	20.4

15.2.2 Processing Method and Saleable Final Products

The optimal processing route proposed by METS as below:

- In-situ copper recovery
- Silver production
- Solvent extraction
- Electrowinning
- Copper sulphate production

Products from the process include:

- LME Copper
- Silver metal
- Copper sulphate

Production of both LME Copper and Copper sulphate are considered for this project to ensure that the project can adapt to copper market fluctuations. The distribution ratio can be determined and adjusted depending on the market and price. This model assumes no copper sulphate production.

15.2.3 Product Price Assumptions

The full market analysis is discussed in the Marketing section of this report. The assumed product pricing for economic analysis of the project is presented in Table 15-3.

Table 15-3 Product Pricing for Economic Analysis

PRODUCT	AUD
LME Copper	14,594.58/t
Copper Sulphate	3,465 / t
Silver	1,629,658.80/t

15.2.4 CAPEX and OPEX

Total CAPEX used in the base case of the financial model for the project is AUD$56,395,202.45 in stage 1 and $401,822,706 in stage 2. The CAPEX breakdown summary is presented in Table 15-4.

Table 15-4 Base Model CAPEX

Description	Capital Cost (AUD)	Stage 2 Capital Cost (AUD)
Total Direct Costs	$34,364,036	$244,847,959
Total Indirect Costs	$22,031,165	$156,974,747
Total Capital Cost AUD	**$56,395,202**	**$401,822,706**

- Direct costs include processing facilities comprising of Area 100 to 600, including associated services such as earthworks, concrete, structural steelwork, mechanical installation, pipework, electrical and instrumentation, roads, freight etc.
- Indirect costs include:
  - Auxiliary facilities: working capital, commissioning, workforce accommodation and meals, temp services, spares and tools.
  - Owners' costs, Insurance and Engineering, Procurement and Construction Management (EPCM)
  - Contingency and Commissioning costs.

Total OPEX used in the base case of the financial model for the project is AUD$18,561,960.89 in stage 1 and $110,767,640 in stage 2 and the breakdown summary is presented in Table 15-5.

Table 15-5 Base Model OPEX

Description	Stage 1 Operating Cost (AUD/t Cu)	Stage 2 Operating Cost (AUD/t)
Reagents	$1,024.34	$1,028.73
Labour	$1,717.34	$115.16
Consumables	$1,003.24	$340.08
Power	$3,045.80	$476.54
Maintenance	$501.62	$204.05
G & A	$1,410.98	$104.74
Water Treatment	$1,051.00	$500.02
Total	**$9,754.32**	**$2,769.33**
Total Operating Cost AUD/a	**$18,561,960**	**$110,767,640**

The financial model is primarily based on a CAPEX and OPEX estimate of scoping study level. It's expected that the accuracy of the model will be enhanced further when the project moves to next study stage. This is when additional engineering to enable vendors/contractors to be engaged in the project who will provide more precise tenders, in-depth study which will allow more accurate information to be defined and updated.

15.2.5 Working Capital

Working capital required for the first year is estimated and included in the CAPEX.

15.2.6 Sustaining Capital

Sustaining capital is valued at 4% of the CAPEX total every year.

15.2.7 Taxes and Royalties

Exclusions include tax, royalties, depreciation, corporate overhead and financing costs, research and development funding and tax incentives. The Project economics will be optimised during subsequent study stages and the financing strategy defined before these cost elements are incorporated into the model.

15.3 Financial Summary

15.3.1 Production Metrics

Production metrics for stage 1 and stage 2, of which the base model is based on are summarised in Table 15-6.

Table 15-6 Production Metric for Base Financial Model

Category	Stage 1 Starter	Stage 2a Full	Stage 2b Full
Resource Leached (t)	1,315,750	27,655,749	27,655,749
Resource (t)	2,803,150	20,557,976	111,327,149
Copper Grade (%)	0.59	0.49	0.40
Silver Grade (g/t)	11.73	7.28	7.20
Contained Copper (t)	16,539	100,734	445,309
Contained Silver (t)	33	150	802
Copper Recovery (%)	36.2	36.2	36.2
Silver Recovery (%)	20.4	20.4	20.4

15.3.2 Financial Metrics

Net Present Value (NPV) was calculated for the stage 1 and stage 2 base case model for a range of discount rates (5 – 10%). Base case results are presented in Table 15-7. As the discount rate increases the NPV amount gradually decreases. For the project's sensitivity analysis, the discount rate of 10% has been applied to accommodate risk and no value was assigned to copper sulphate product.

Table 15-7 Base Case Model NPV

Discount Rate %	NPV (AUD)	NPV (USD)
5	$1,165,176,224.06	$756,607,937.70
6.25	$1,082,044,139.09	$702,626,064.34
7.50	$1,005,466,129.61	$652,900,084.16
8.75	$934,854,096.53	$607,048,114.63
10.00	$869,679,059.11	$564,726,661.76

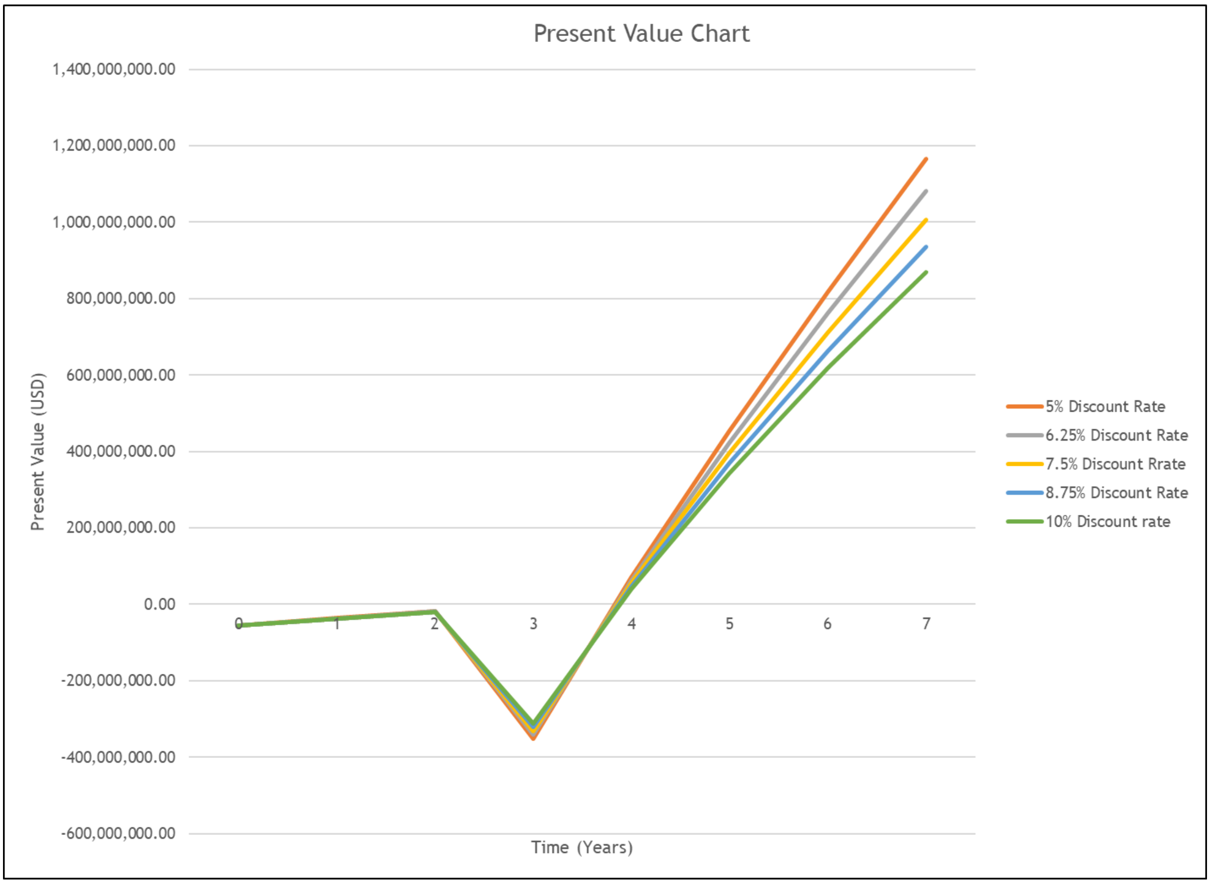

Figure 15-1 NPV Chart

15.4 Sensitivities Analysis

15.4.1 Copper Recovery Sensitivity

A sensitivity analysis of the copper recovery was undertaken, which aims to evaluate the impact of the recovery on the net present value and internal rate of return. A range of between 30 to 60% recovery was used and the NPV results are shown in Figure 15-2.The results showed that NPV increased as the copper recovery increased.

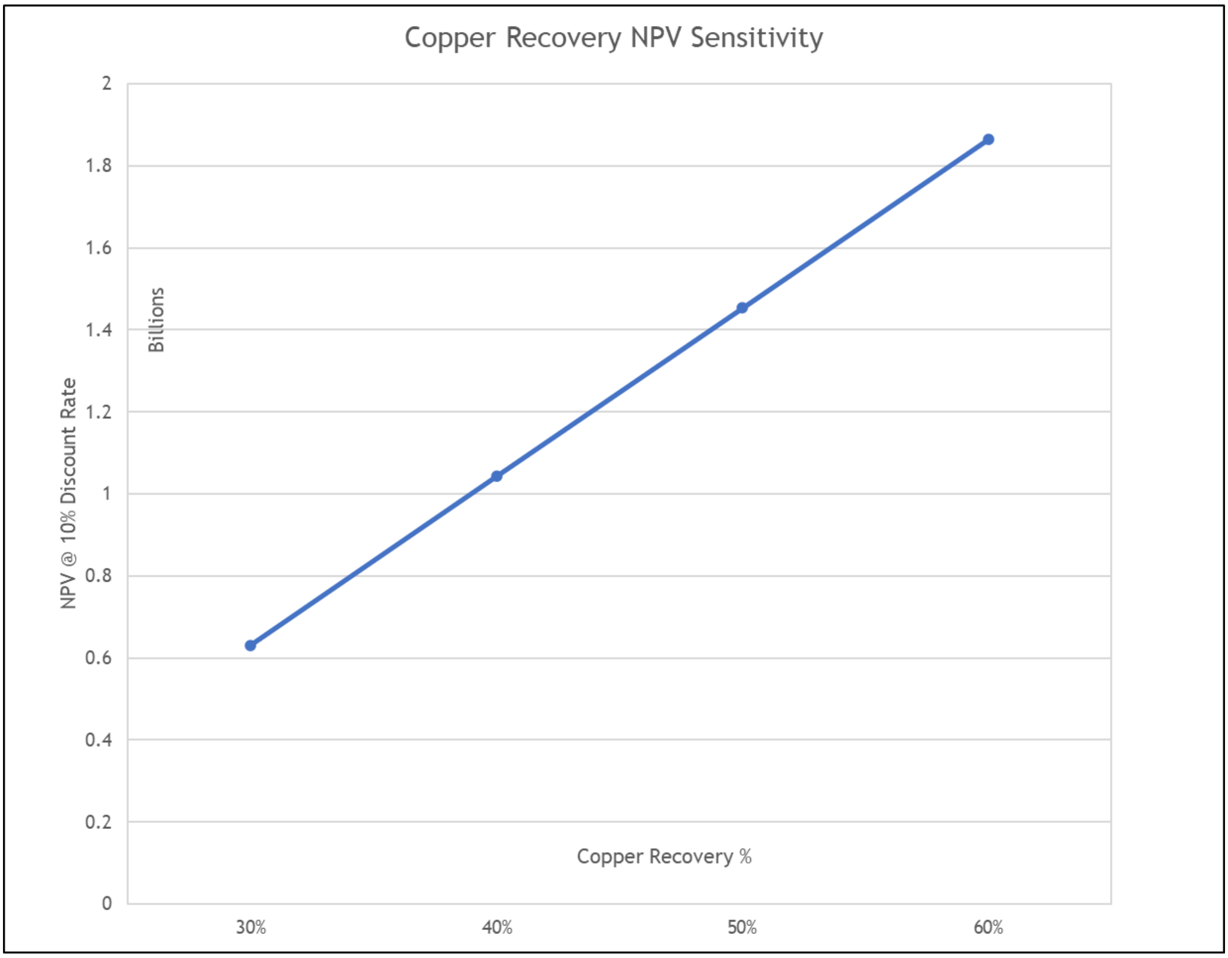

Figure 15-2 NPV for Copper Recovery Sensitivity

The IRR results for the Cu recovery sensitivity analysis performed on the base case model is shown in Table 15-8 and on a chart Figure 15-3. For the copper recovery range of 30 to 60% IRR values range from 63.10% to 132.56% showing a gradual increase. The payback period decreases as recovery increases showing a significant decrease when recovery increase from 30 to 40% and a gradual decrease when it increases to 60%.

Table 15-8 NPV, IRR and Payback periods for Copper Recovery Sensitivity

Copper Recovery	30%	40%	50%	60%
NPV @ 10% DISCOUNT RATE	$631,056,218.46	$1,042,291,855.54	$1,453,527,492.62	$1,864,763,129.70
IRR	63.10%	88.79%	111.54%	132.56%
Payback Period – Stage 1	0.85	0.45	0.30	0.23
Payback Period – Stage 2	1.69	1.09	0.81	0.64

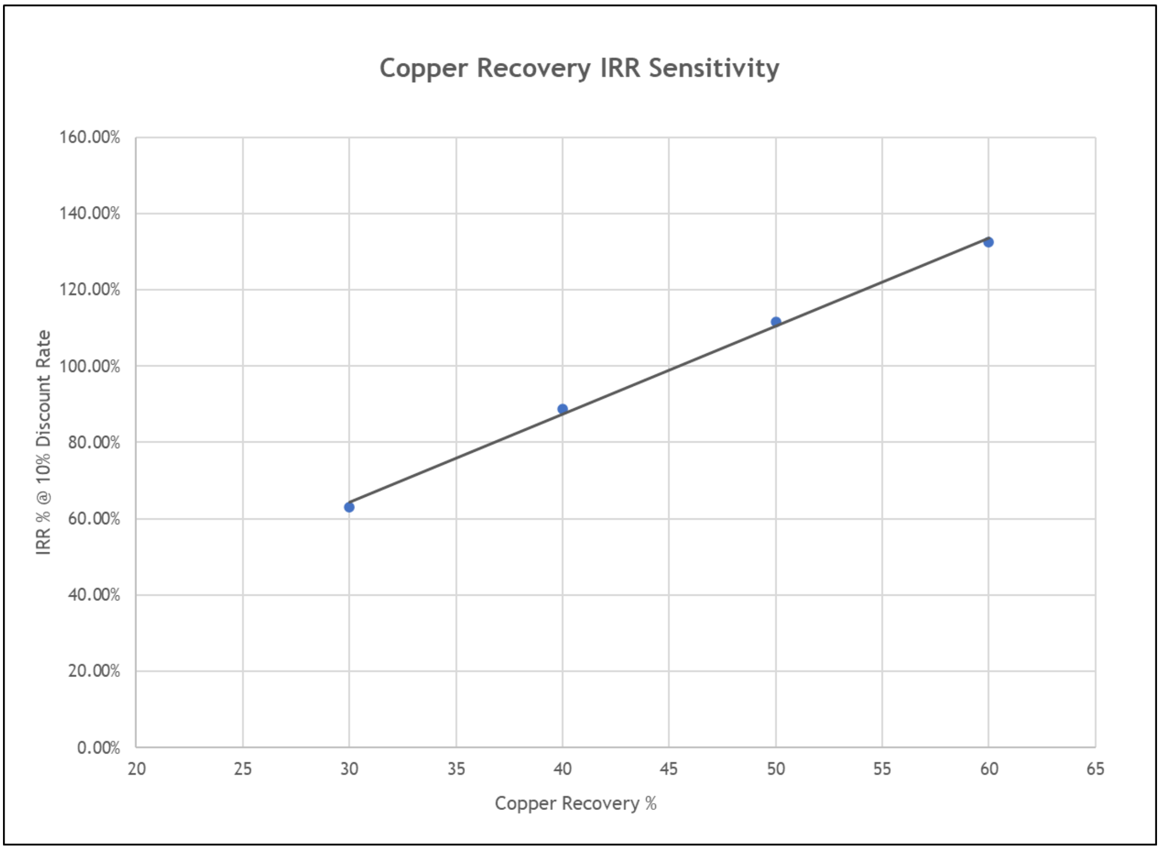

Figure 15-3 IRR for NPV for Copper Recovery Sensitivity

15.4.2 NPV Sensitivity Analysis

A sensitivity analysis of Net Present Value (NPV) was undertaken, which aims to evaluate the impact of the following key variables to the overall project economics, results as indicated in Table 15-9 and Figure 15-4.

It is important to note that when the copper and silver feed grades were varied both stage 1 and stage 2 values were considered for each scenario.

Variations up to ±20% have been modelled for the following factors:

- CAPEX
- OPEX
- Copper price
- Silver price
- Copper feed grade
- Silver feed grade

Table 15-9 NPV Sensitivity

Scenario	-20%	-10%	0	+10%	+20%
CAPEX	$964,693,479.02	$924,475,567.49	$869,679,059.11	$844,039,744.43	$803,821,832.90

Scenario	-20%	-10%	0	+10%	+20%
OPEX	$941,716,998.74	$912,987,327.35	$869,679,059.11	$862,155,872.73	$826,798,313.18
Copper Price	$586,875,986.21	$735,566,821.09	$869,679,059.11	$1,032,948,490.83	$1,181,639,325.71
Silver Price	$850,467,175.74	$867,362,415.85	$869,679,059.11	$901,152,896.07	$918,048,136.18
Copper Feed Grade	$586,875,986.21	$735,566,821.09	$869,679,059.11	$1,032,948,490.83	$1,181,639,325.71
Silver Feed Grade	$850,467,175.74	$867,362,415.85	$869,679,059.11	$901,152,896.07	$918,048,136.18

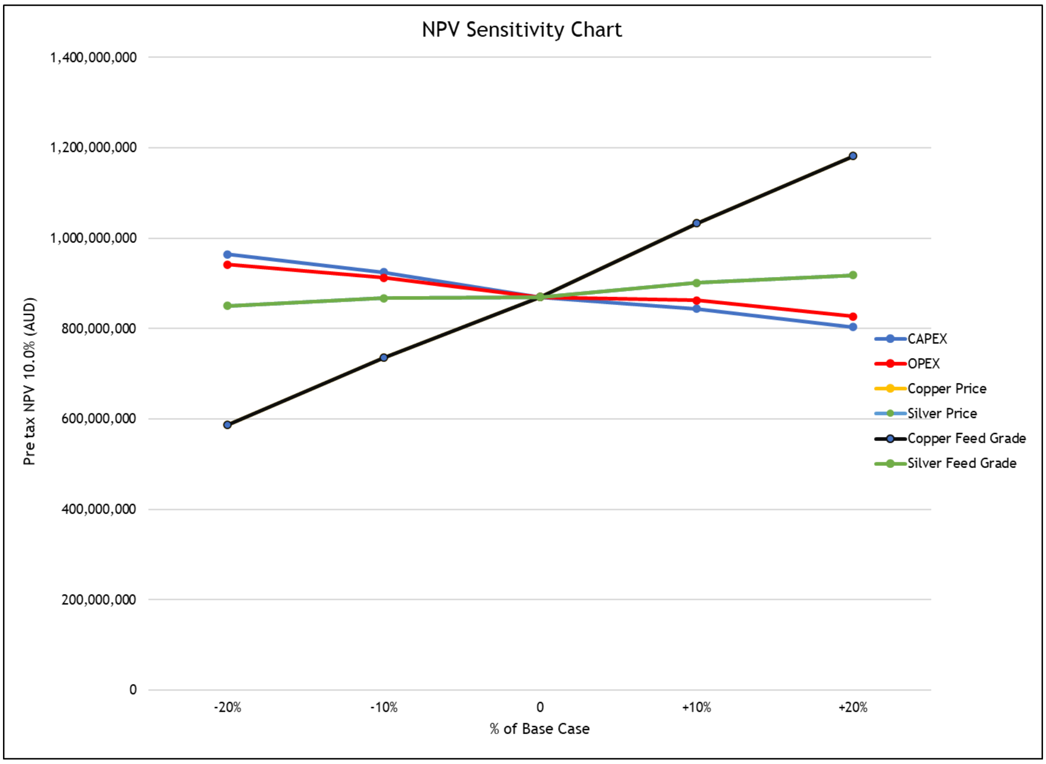

Figure 15-4 NPV Sensitivity Analysis

Changes in the copper price and copper grade have the same effect on the project economics. Similar relation is shared between the silver price and silver grade. The increase of the individual variables has a positive impact on the NPV. Copper feed grade and copper price affect the NPV the most.

Changes in the CAPEX and OPEX affects the NPV where an increase in either decreases the NPV. The CAPEX and OPEX are inversely proportional to the NPV. Changes in the copper price impacts NPV more than changes in either the CAPEX or OPEX which have lesser impact on the NPV. The results also show that regardless of the variations in the +/- 20% range on all the variables the economics stayed resilient and this represents a positive business case.

15.4.3 IRR Sensitivity Analysis

A sensitivity analysis of Internal Rate of Return (IRR) was undertaken, which aims to evaluate the impact of the following key variables to the overall project economics, results are indicated in Table 15-10 and Figure 15-5 for both stages. Variations up to ±20% have been modelled for the following factors:

- CAPEX
- OPEX
- Copper price
- Silver price
- Copper feed grade
- Silver feed grade

It is important to note that when the copper and silver feed grades were varied both stage 1 and stage 2 values were considered for each scenario.

Table 15-10 Internal Rate of Return Sensitivity

Scenario	-20%	-10%	0	+10%	+20%
CAPEX	97.4	87.6	75.7	72.2	66.0
OPEX	83.6	81.5	75.7	77.6	75.2
Copper Price	60.1	70.0	75.7	88.2	96.8
Silver Price	77.3	78.3	75.7	80.4	81.5
Copper Feed Grade	60.1	70.0	75.7	88.2	96.8
Silver Feed Grade	77.3	78.3	75.7	80.4	81.5

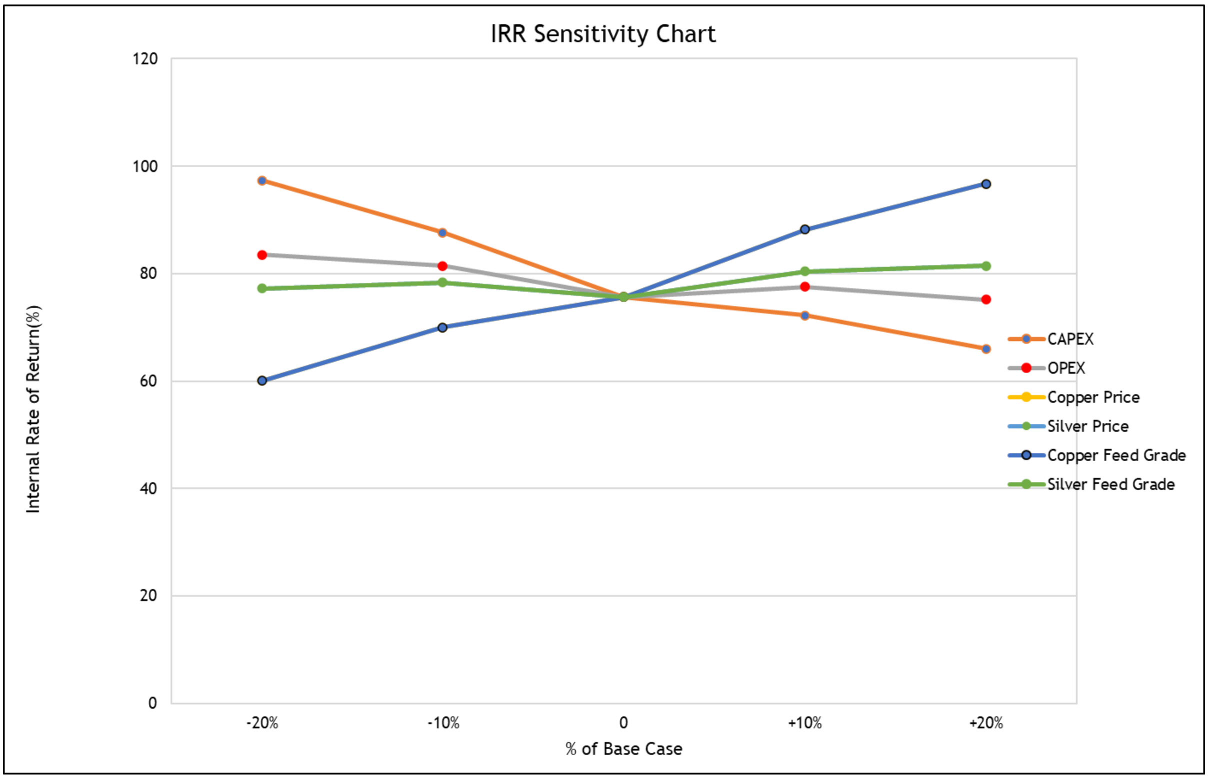

Figure 15-5 Internal Rate of Return (IRR) Sensitivity

The copper price and copper feed grade variations have the same effect on the project economics in terms of the IRR. In line with this, the silver price and silver feed grade variations also have the same effect on the projects IRR in this +/-20% range. The increase of these individual variables is directly proportional to the IRR. Copper feed grade and copper price affect the IRR the most.

Changes in the CAPEX and OPEX affects the NPV with similar effect. An increase in both individually decreases the IRR. The CAPEX and OPEX are inversely proportional to the IRR.

Within the variation range examined, the IRR remained in relatively the same range, with a change of less than 30%. These results indicate that regardless of the variations in the +/-20% range on all the variables mentioned the effects will not drastically change the IRR. A higher range in variation will be required to significantly increase it.

15.4.4 Payback Period

The payback period is in years and was calculated according to the cashflow of the model in different scenarios. Variations up to ±20% have been modelled for the following factors:

- CAPEX
- OPEX
- Copper price
- Silver price
- Copper feed grade
- Silver feed grade

Table 15-11 shows the summary for the Stage 1 Payback Periods and Table 15-12 shows the summary for Stage 2 Payback Periods.

Table 15-11 Payback Period Sensitivity Stage 1

Scenario	-20%	-10%	0	+10%	+20%
CAPEX	0.38	0.46	0.56	0.65	0.78
OPEX	0.51	0.53	0.56	0.57	0.60
Copper Price	0.94	0.69	0.56	0.45	0.39
Silver Price	0.57	0.56	0.56	0.53	0.52
Copper Feed Grade	0.94	0.69	0.56	0.45	0.39
Silver Feed Grade	0.57	0.56	0.56	0.53	0.52

Table 15-12 Payback Period Sensitivity Stage 2

Scenario	-20%	-10%	0	+10%	+20%
CAPEX	0.96	1.10	1.27	1.43	1.61
OPEX	1.20	1.23	1.27	1.29	1.34
Copper Price	1.80	1.48	1.27	1.10	0.97
Silver Price	1.31	1.28	1.27	1.24	1.22
Copper Feed Grade	1.80	1.48	1.27	1.10	0.97
Silver Feed Grade	1.31	1.28	1.27	1.24	1.22

Increasing the OPEX and CAPEX values directly increases the payback period since an increase in expenses reduces cashflow. Increasing the commodity prices and or grade directly reduces the payback period. This increases revenue hence increases cashflow. Copper price and copper grade changes affect the payback period in the same way. Silver price and silver grade also follows this trend. Changes in the CAPEX values affect the payback period the most. The results also show that regardless of the variations in the +/- 20% range in all the scenarios investigated the payback period stayed within the same range and did not exceed more than 2 years. This represents a positive business case showing that despite changes in the economic environment of the project it will be able to sustain itself and produce enough to return invested funds within 2 years of operating.

16. RISK ASSESSMENT AND OPPORTUNITIES

METS has performed a high-level risk assessment to highlight the major risks to the Cobre Copper project that could impact the development and operation of the project.

16.1 Risk Assessment

Risk is defined in the Australian/New Zealand Standard Risk Management (AS/NZS ISO 31000:2018), as "effect of uncertainty on objectives".

Risk has two characteristics that need to be understood to be managed:

- It has a focus on future events; therefore, it deals in uncertainty.
- It generally focuses on unfavourable events, although the process can be used to identify and manage opportunities.

The Standard AS/NZS ISO 31000:2018 provides a generic guide for managing risk. The document outlines the principles and guidelines for risk management, criteria should be defined by the organisation to evaluate the significance of risk. The criteria should reflect the organisation's values, objectives and resources. Some criteria can be derived from legal and regulatory requirements and other requirements to which the organisation subscribes. Risk criteria should be consistent with the organisation's risk management policy and be defined at the beginning of any risk management process and be continually reviewed.

When defining risk criteria, factors to be considered should include the following:

- The nature and types of causes and consequences that can occur and how they will be measured
- How likelihood will be defined
- The timeframe(s) of the likelihood and/or consequence(s)
- How the level of risk is to be determined
- The views of stakeholders
- The level at which risk becomes acceptable or tolerable

Whether combinations of multiple risks should be considered and, if so, how and which combinations should be considered.

16.2 Dimensions of Risk

Risk has two dimensions that need to be jointly assessed to determine its magnitude; likelihood and consequence as described in Table 16-1.

Consequence is the extent to which a given event has an impact on objectives. It is also referred to as severity and the two terms are interchangeable. Consequence can be expressed qualitatively (e.g., high) or quantitatively (e.g., $2 million). A risk may also have more than one consequence.

Likelihood is used to refer to the chance of something happening. In the case of the consequence being realised in relation to the risk. Likelihood can be defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically such as a probability or a frequency over a given time period.

Table 16-1 Risk Matrix

Consequence / Likelihood	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Almost Certain (5)	High Risk 5	High Risk 10	Extreme Risk 15	Extreme Risk 20	Extreme Risk 25
Likely (4)	Moderate Risk 4	High Risk 8	High Risk 12	Extreme Risk 16	Extreme Risk 20
Possible (3)	Low Risk 3	Moderate Risk 6	High Risk 9	Extreme Risk 12	Extreme Risk 15
Unlikely (2)	Low Risk 2	Low Risk 4	Moderate Risk 6	High Risk 8	Extreme Risk 10
Rare (1)	Low Risk 1	Low Risk 2	Moderate Risk 3	High Risk 4	High Risk 5

Risk management process can be applied to resource projects as an essential part of good business management practice.

16.3 Risk Assessment Methodology

The methodology used for the risk assessment encompass the following activities:

- Risk identification and definition
- Risk analysis
- Risk evaluation
- Risk mitigation strategies
- Residual risk evaluation
- Communicate risks and review of action plans.

In this stage of the project, risk evaluation, risk mitigation and residual risk evaluation to the initial identified risks will not be undertaken.

16.3.1 Australian Standard Framework

The methodology for METS risk assessments are based on the Australian Standard AS/NZS ISO 31000:2009 framework. Figure 167-16-1 shows the framework.

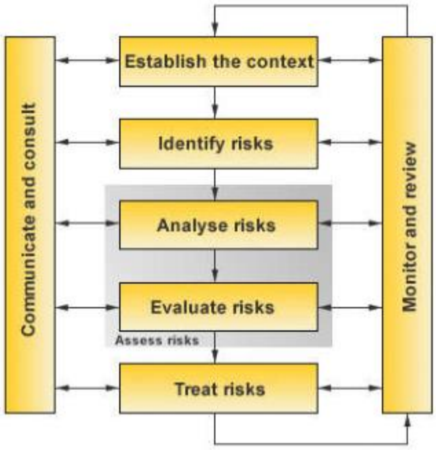

Figure 167-16-1 Australian Standard AS/NZS ISO 31000:2009 Risk Management

Risks are then assessed in terms of the likelihood of the risk occurring and the consequence if it did occur. Semi-quantitative descriptors are used for the consequence and likelihood criteria were used as shown in Table 16-2 and Table 16-3 respectively.

Table 16-2 Risk Assessment Matrix - Consequence Ranking

Level	Safety	Environment	Quality	Equip/Asset Damage or lost savings	Production Interruption
5 Catastrophic	Fatality or permanent disability	Major issue serious long term impact	Product unsaleable after rework (dumping required), loss of market share	>$10 M	>1 month
4 Major	LTI/SPI	Significant issue medium term impact	Intermediate or final product contamination, no ability to rectify, reduced revenue for product or contract shipment cancelled	$5 M to $10 M	1 week to 1 month
3 Moderate	MTI	Continuous issue but limited impact	Product impurities, rework will correct problem	$1 M to $5 M	24 hrs to 1 week
2 Minor	MI	Minor non-recurring issue	Intermediate product impurities rework will rectify problem	$100,000 to $1 M	4 hrs to 24 hrs
1 Insignificant	Minor incident	Technical issue, involving environ. laws and regs.	Internal or non-contractual off-specification	<$100,000	<4 hrs

Table 16-3 Risk Assessment Matrix - Likelihood Ranking

Level	Descriptor	Likelihood	
		Description	Frequency
5	Almost Certain	The event is expected to occur in most circumstances	More than once per year
4	Likely	The event will probably occur in most circumstances	At least once a year
3	Moderate	The event should occur at some time	At least once in 3 years
2	Unlikely	The event could occur at some time	At least once in 10 years
1	Rare	Then event may occur in exceptional circumstances	Less than once in 15 years

16.4 Scope of Risks

The scope has focussed on events, which will happen in the future and therefore have an uncertain or unpredictable outcome. The extent to which an event is predictable is dependent on a number of factors including its uniqueness, the amount of information available from previous similar events and the degree of correlation between the event and other predictable or measured factors.

Resource projects by their very nature are unique; therefore, there is a high degree of uncertainty about whether the project objectives will be achieved. Even though the unit processes within the project are relatively predictable and not new technology, the relationship between the processes and interlinking is such that the outcome is less certain.

Risks were categorised under the following areas:

- Geology and Resources
- Hydrogeology and Hydrology
- Geotechnical and Mining
- Metallurgy, Process Plant & Infrastructure
- Construction and Commissioning
- Finance
- Legal, Compliance and Statutory Reporting
- Occupational Health, Safety and Environment & Social.

16.4.1 Identifying the Risks

The analysis for the Scoping study looked at the options for the project, based on the information provided and METS and project stakeholder experience identified risks and possible events that could impact on the project.

16.4.2 Analyse the Risks

This involves assessing the likelihood and consequence of the identified risk events. The analysis will be quantitative or qualitative to provide the information and determine probabilities. The main objective being to rank risk rather than assign a value.

16.4.3 Risk Register Review Workshop

On the 3rd July 2024, project stakeholders from Cobre, WSP and METS undertook a risk workshops to review the current project risk register for input into this the project risk register.

16.5 In situ Copper Recovery

METS developed a risk register for the option of in-situ copper recovery at the Cobre Copper Project. This risk register can be found in Appendix I and lists the project risks and opportunities.

16.5.1 Risks and Mitigation

16.5.1.1 Geology and Resources

The register identifies seventeen risks associated with the geology and resource sector. Key risks are lower than expected grades, variability in mineralogy and ore characteristics and the presence of non-leaching ores such as chalcopyrite. These factors impact recovery and reduce revenue. The formation of precipitates within the actual underground leach zone along with carbon dioxide may impact sweep efficiency and lower pumping resulting in decreasing recovery and throughput of target metals when compared to the theoretical values. The existence of a higher concentration of impurities such as iron in the ore could cause a reduction in downstream processing efficiency.

Mitigation strategies focus on addressing these critical risks through several approaches. For lower grades and non-leaching ores, real-time monitoring, modelling and flexible leaching techniques are implemented to optimise recovery rates. This includes pilot testing of the wellfield. The incorporation of variability data into predictive modelling and continuous improvement in wellfield management to manage steady state PLS grades and reduce leaching of impurities and consequent build up in the ISCR operation and processing circuit. This includes the use of processing techniques downstream such as a scrubbing stage in the SX plant to remove iron and clarifiers. Additionally, the presence of carbon dioxide is mitigated by monitoring CO_2 levels in well field via drill hole sensors, which helps to sustain effective pumping and overall copper recovery, thereby ensuring stable site throughput.

16.5.1.2 Hydrogeology and Hydrology

Eleven risks are identified through the risk register for hydrogeology and hydrology. The most risk is associated with the availability of water for the project and the quality of this water. A reduction in water availability will cause an increase cost for piping to transport the water.

An additional risk is associated with water quality. A decrease in water quality can have a variety of effects, ranging from an increase in cost to treat the water or possibly a decrease in leaching efficiency. Poor water management also impacts the site, as evaporation and water losses must be tracked to continue to supply the process with sufficient water.

A risk to the wellfield performance exists with operation of the wellfield pumps. Over time the well head pressure may build up. As the well head pressure increases the wellfield performance will drop, causing reduced leachability and copper recovery.

These risks are mitigated by ensuring water availability and quality through water-saving technologies, alternative sources, and advanced treatment systems. Groundwater is managed with regular monitoring and deeper wells, while reservoirs and surface water recycling reduce resource dependency. Well head pressure is controlled by pump maintenance and pressure relief systems, ensuring leachability and copper recovery. Permeability is optimised through geophysical surveys and well placement, supported by real-time monitoring and hydrogeological mapping. Good management of wellfield flows along with monitoring wells and sampling programs will be important to maintain wellfield integrity.

16.5.1.3 Geotechnical and Mining

Geotechnical and Mining has fourteen identified risks on the register. ISCR copper mining currently does not have a prevalent track record, with no historical data present. Key risks include the potential for short circuits in wellfield arrangements, ineffectiveness of the spacing, the threat of unidentified containment breaches, and defining the effectiveness of the footwall and hanging wall to contain the field. Additionally, the wells present in the ISCR have increased depth due to 70 m overburden and mineralisation extending beyond 200 m, resulting in higher well drilling and casing costs. Other important risks involve poor fracturing and connectivity within the ore body, which can lead to inefficient leaching and reduced copper recovery.

To mitigate this, many key geotechnical and mining factors in solution mining must be closely monitored. Effective spacing in wellfield arrangements is crucial to avoid short circuits, and directional drilling techniques can be implemented to optimise well placement. It is equally important to monitor the wells regularly to prevent unidentified containment breaches, especially with deeper wells due to overburden. The geological characteristics of footwalls and hanging walls must be carefully assessed, as fractures or faults in these formations can disrupt the flow of the leaching solution, leading to reduced recovery rates. Detailed geological mapping, proper well placement, and flow modelling can help manage these risks. Additionally, pre-fracture analysis and modelling can improve ore body connectivity, and reinforcing well casings is critical to preventing leaks and ensuring long-term stability. Continuous monitoring and maintenance of all wellfield components, including pumps, is necessary to detect issues early and minimise operational disruptions and maximising recovery.

16.5.1.4 Metallurgy, Process Plant & Infrastructure

The risk register identifies thirty-nine risks associated with Metallurgy, Process Plant & Infrastructure. Many of the risks are caused by the location of the site. Transport costs for both shipping and air travel will be higher due to the remote location. The surrounding road conditions may impact the rate at which deliverables are imported and exported from the site. Managing the wellfield and accurate metallurgical accounting will pose a challenge for the site, as tracking recoveries through the wellfield will be much harder than traditional mining. Diligence in preventing leaks is key to the success of the project as this will minimise environmental and social damage from preventable spillage of process streams. Due to the isolated nature of the site, costs to repair and maintain equipment will be higher.

To mitigate these risks, several strategies can be implemented. For transportation and logistics, strategic planning is essential, including pre-assessment of road conditions and securing long-term shipping and air transport contracts to manage costs effectively. Implementing monitoring and modelling systems and real-time data analysis can improve the accuracy of metallurgical accounting and wellfield management, ensuring better recovery rates. Regular maintenance schedules, combined with the use of anti-scaling agents and water treatment systems, can reduce the impact of scale build-up and leaks, lowering repair and maintenance costs. Additionally, exploring renewable energy solutions and modular infrastructure can help reduce the operational expenses associated with the site's remoteness, enhancing overall project sustainability.

16.5.1.5 Construction and Commissioning

For Construction and Commissioning eight associated risks were identified. First risk is a lack of available contractors and skilled trade workers within the country. This will lead to higher costs for the construction of the site. Increased logistical costs are also prevalent, as organising transport and accommodation during the construction phase will be necessary. Acquiring sufficient materials of construction will prove challenging. To supply the site with ample materials a batch concrete plant may be required.

Some mitigants include developing local workforce training programs and securing long-term contracts with transport and accommodation providers can help manage costs. Establishing a batch concrete plant can ensure a steady supply of construction materials.

16.5.1.6 Finance

Eight risks associated with the project’s finance were identified. A drop in copper price could damage the profitability of the site. A lack of copper production could also affect the site revenue. The most likely reason for reduced copper production is a lower copper recovery than test work and pilot ISCR predicted. Site operations may become unsustainable due to inflation or developmental cost changes through external factors.

To mitigate these risks, implementing hedging strategies against copper price fluctuations, diversifying revenue streams, and securing flexible funding options can help stabilise the site's finances. Accurate cost estimation and regular budget reviews are also crucial.

16.5.1.7 Legal, Compliance and Statutory Reporting

Within the field of Legal, Compliance and Statutory Reporting seven risks were declared in the register. Primarily, project development delays are the most likely risk outcome, caused by permitting, environmental, and legal issues. Moreover, mine closure or decommissioning may have unforeseen costs resulting in an inaccurate mine closing cost forecast.

These risks can be mitigated by early engagement with regulatory authorities, regular follow-ups, and proactive planning for mine closure can reduce delays and unforeseen costs.

Conducting thorough environmental impact assessments and engaging with local stakeholders will be very important. Establishing stable agreements with the host government can also provide financial security.

16.5.1.8 Occupational Health, Safety and Environment & Social

Occupational Health, Safety and Environment & Social had nineteen associated risks identified. There are many environmental issues that may lead to site damage or personnel being harmed. These include acid burns, fumes, fire particularly associated with the solvent extraction plant, flooding, earthquakes, leakages and heavy storms. Each of these events poses a threat to the operational continuity and effectiveness of the site. On the social side, corruption, skilled labour availability, mining opposition and security risks could also negatively impact the success of the site.

Process plant design and engineering of barriers and mitigations, providing proper PPE, enhancing security measures, and developing emergency response plans can improve safety and reduce risks to personnel. The installation of fire detection and suppression systems is imperative along with regular drills and equipment inspections. Community engagement and anti-corruption programs can strengthen social relations and reduce opposition. Implementing environmental management systems and regular maintenance can mitigate environmental risks.

16.5.2 Risk Profile

The project risk assessment undertaken for the concept study identified a total of 123 risks. The break-down of these risks to their ranking level is shown in Table 16-4.

Key risks were assessed for geological and resources, hydrogeology and hydrology, geotechnical and mining, metallurgy, process plant & infrastructure, construction and commissioning, finance, legal, compliance and statutory reporting, occupational health, safety and environmental & social.

Table 16-4: Risk Summary

Risk Ranking Area	Number of Risks Identified Extreme	High	Moderate	Low	Total
Geology and Resources	7	10	0	0	**17**
Hydrogeology and Hydrology	3	8	0	0	**11**
Geotechnical and Mining	2	12	0	0	**14**
Metallurgy, Process Plant & Infrastructure	23	15	1	0	**39**
Construction and Commissioning	8	0	0	0	**8**
Finance	8	0	0	0	**8**
Legal, Compliance and Statutory Reporting	7	0	0	0	**7**
Occupational Health, Safety and Environmental & Social	13	3	3	0	**19**
Total	**71**	**48**	**4**	**0**	**123**

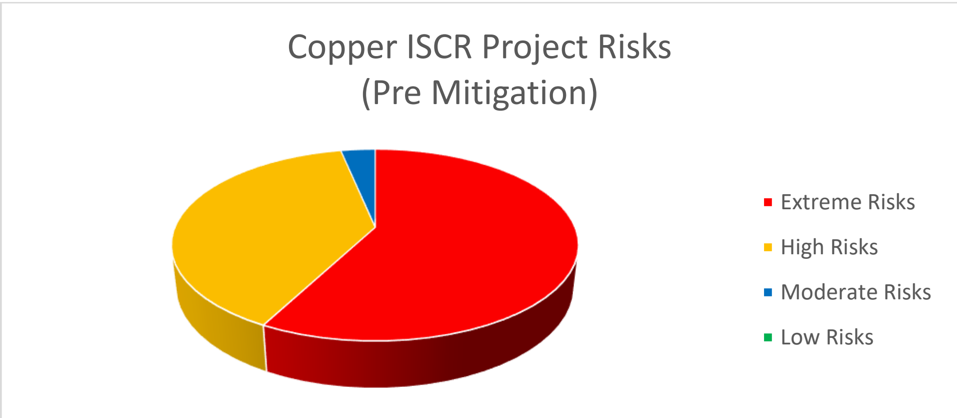

Figure 16-2 Copper ISCR Project PFS Risks (Pre-Mitigation)

16.5.3 Residual Risk Profile

The risks were reassessed after the implementation of the risk treatment mitigation strategies that were identified. The residual risk assessment reduced the ranking of the risks considerably. The breakdown of residual risks to their ranking level is shown in Table 17-5

Table 16-5: Residual Risks

Risk Ranking Area	Number of Risks Identified Extreme	High	Moderate	Low	Total
Geology and Resources	0	7	7	3	**17**
Hydrogeology and Hydrology	0	2	8	1	**11**
Geotechnical and Mining	0	4	3	7	**14**
Metallurgy, Process Plant & Infrastructure	0	11	27	1	**39**
Construction and Commissioning	0	0	8	0	**8**
Finance	0	0	8	0	**8**
Legal, Compliance and Statutory Reporting	0	0	7	0	**7**
Occupational Health, Safety and Environmental & Social	0	0	19	0	**19**
Total	**0**	**24**	**87**	**12**	**123**

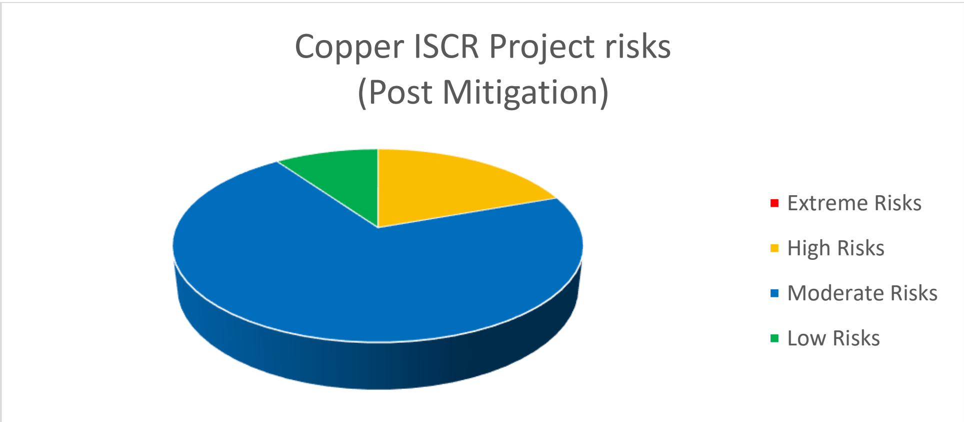

Figure 16-3 Copper ISCR Project PFS risks (Post Mitigation)

16.5.4 Key Risks

The key residual risks are presented in the following information with the full risk register available in Appendix I.

16.5.4.1 Extreme Risks

After implementation of mitigation strategies, there are no risks currently classified as "Extreme".

16.5.4.2 High Risks

Some of the residual risks classified as "High" are identified below.

Geology and Resources

- Recoverable copper: Copper in the ore is lower than predicted from test work and modelling, leading to reduced copper production and lower revenue.
- Ore Body Variability: Unidentified or untested ore zones could lead to unpredictable recoveries and affect project viability, potentially causing operational delays and higher costs.
- Chalcopyrite: Non-leaching copper ores like chalcopyrite may result in lower than predicted recoveries, leading to reduced copper production and decreased revenue.
- Carbonates: Higher than predicted carbonate levels may result in increased acid consumption and carbon dioxide (CO_2) formation, reducing copper recoveries and increasing costs, ultimately leading to lower revenues.
- Impurities: A buildup of impurities in the raffinate during processing lead to reduced SX efficiency.
- Precipitates: Formation of precipitates underground leading to lower sweep efficiency and reduced copper leaching and recovery rates.
- Mineralogy: Refractory Mineralogy cause lower than expected copper recoveries results in low copper productions and low revenue.

Hydrogeology and Hydrology

- Permeability and Porosity: Low permeability and porosity may reduce copper leachability and recovery, leading to lower revenues and increased operational time and costs.
- Variability: Hydrogeology variability along the ore body may lead to variable wellfield performance and inconsistent copper recoveries

Geotechnical and Mining

- Hanging Wall: Uncertainty or variability in the hanging wall could affect the containment of the wellfield and ore body.

- Footwall: The definition and stability of the footwall below the ore body may affect the containment of the wellfield and ore body.
- Well Casing: Drilling through 70 m of overburden requires additional well casing, leading to increased costs.
- Low Grade: Low grade ore could lead to reduced recoveries and subsequently reduced revenue.

Metallurgy, Process Plant & Infrastructure

- Leaching Kinetics: Leaching Kinetic slower than predicted could result in reduced field performance and reduced recoveries which would end in shortfalls in project revenues.
- Impurities: Impurities in the leach liquor, particularly the control of Fe, can lead to reduced solvent extraction and electrowinning efficiency and lower recovery rates.
- Acid Consumption: Higher-than-expected acid consumption could significantly increase operating costs due to the need for additional supply, transportation, and storage.
- Salt Effect: The presence of salt can negatively impact the efficiency of the solvent extraction and electrowinning (SX/EW) processes, leading to increased downtime, higher maintenance costs, and reduced revenue.
- Shipping: The remote location of the site may lead to higher-than-anticipated shipping costs, impacting the project's profitability due to longer transport routes and logistical challenges.
- Logistics: High transport costs arise due to the remoteness of the location and the large consumption of reagents.
- Non process infrastructure: Capital cost to develop sufficient infrastructure to support the project could be substantial due to remoteness of site.

Construction and Commissioning, Finance, Legal Compliance, Statutory Reporting, and Occupational Health, Safety, Environmental & Social: No major risks remain after mitigation

16.5.5 Opportunities

Some of the key opportunities identified included:

Directional drilling can be utilised to develop the wellfield, especially when dealing with the narrow orebody, where the risk of missing the selected target is higher. By providing more control over well placement and spacing, directional drilling assists the likelihood that solvent will travel along the strike of the orebody, ensuring better contact with the mineralised zones. Improved control over well spacing also reduces the likelihood of short circuiting and enhances copper recovery across the wells. Drill hole ore samples can be leached in advance to map the field for recoveries. By head assaying and leaching drill holes ore samples (and any core available in the wellfield location) over select intervals allows metallurgical mapping of the proposed ISCR well field. This not only provides confidence in the metallurgical head assaying (reconciliation) but provides modelling data from the leaching of the core/ drill hole material and increases the reliability of predicted recovery. During operations the combination of solution monitoring, ongoing metallurgical testwork leaching on field drill hole sampling, geological assays and modelling will provide reporting confidence for metallurgical accounting through the ISCR field along with normal metallurgical accounting procedures implemented in the processing plant.

Defining areas of high-grade copper will also be useful for increasing the confidence in life of mine modelling.

Laboratory test work can be utilised to increase copper extraction. Chloride ion testing can be used to reduce passivation from sulphur present in the ore body which can enhance both copper and silver extraction. Bacteria assisted leaching can be tested as an alternative to high acid and ferric consumption to reduce the operating costs of copper leaching and refinement. Alternatively, an acid plant could be constructed to allow site production of acid thereby reducing transport costs associated with acid shipping. By implementing real-time monitoring and control systems for acid usage, the site can reduce excess consumption, improve efficiency, and lower overall operating costs. Any reagents will circulate through the circuit and may accumulate over time. Solvent extraction plants are sensitive to the buildup of certain reagents and impurities, which can impact efficiency. By optimising the use of reagents and inhibitors, the site can reduce acid consumption and minimise the risk of buildup, thereby extending the life of equipment exposed to harsh conditions.

Renewable energy could be used as an alternative to traditional fuels. Due to the current plant location, there may be high pumping costs, especially with potential wellfield expansions. By utilising renewable energy sources, the associated costs could be reduced.

The nearby saltwater Lake Ngami could be used as a reliable source of water. It also doubles as a reliable source of salt. Future testwork may prove that this salt may prove valuable in the extraction of silver from the project

Establishing bulk reagent storage closer to the site or developing a dedicated logistics plan with strategic partnerships could reduce the transportation costs for critical materials.

Implementing automation technologies in the process plant could improve consistency in copper recovery and reduce human error. Automated systems for metering reagent usage, flow control, and grade monitoring would enhance operational efficiency while potentially reducing costs.

17. ENVIRONMENTAL AND PERMITTING

This section provides a high-level overview of the environmental and permitting considerations relevant to the in-situ copper recovery project. The project is currently compliant with the Department of Environmental Affairs under an Environmental Management Plan (EMP) that was initially designed for exploration activities. As the project transitions towards operational phases, it will be essential to assess the adequacy of the existing EMP and identify any additional environmental safeguards or permits that may be required. This chapter outlines the current environmental status and describes, in general terms, the necessary steps for ensuring continued compliance and environmental responsibility as the project develops.

17.1.1 Existing Environmental Management Plan (EMP)

The current Environmental Management Plan (EMP) was developed specifically for the exploration phase of the project. It outlines key environmental controls and monitoring programs designed to mitigate the impact of exploration activities on the surrounding environment.

The EMP covers general environmental aspects such as water management, air quality, and soil preservation, ensuring that these critical areas are monitored and remain within acceptable limits. Regular reports are submitted to the Department of Environmental Affairs, demonstrating compliance with the established guidelines.

While the EMP has been effective in managing exploration activities, it will require revisions as the project transitions into more active development phase of the in-situ copper recovery project. These potential adjustments will be evaluated to address the broader environmental concerns related to the leaching process, such as groundwater protection, monitoring the wellfield for leaks, waste management, and emissions control.

17.1.2 Government Authorities & Identified Stakeholders

It is essential for Cobre to consult and engage with government organisations and decision-making authorities across numerous government agencies during the development of the project. Government relations are relevant to project development, operational and post mining phases of the project. Identification of stakeholders requiring or already engaged in consultation includes:

- Department of Mines
- Ministry of Minerals, Energy, and Water Resources

The project, located in the Kalahari Copper Belt, covers a large area with a sparse population. Consultation and engagement with community organisations and members are crucial to the project's development and success. Preliminary stakeholders identified include:

- Traditional Authorities and Community Leaders: These are essential for ensuring the community's concerns regarding land use, compensation, and employment opportunities are addressed, and for maintaining a social license to operate.

- Local Land Boards: Responsible for managing access to tribal land, securing land-use agreements, and resolving any disputes related to land rights within the project area.
- Environmental Conservation Organisations: Local and international environmental organisations will be key stakeholders to ensure that wildlife conservation, especially in "Elephant Country," is integrated into the project's environmental management plans.

17.2 Legal and Permitting

A summary of the primary and secondary environmental approvals required for development and operation of the Ngami Copper Project is provided in Table 17-1.

17.2.1 Primary Approvals

In accordance with both Botswana Standards and international principles, the primary approvals required include a mining license from the Ministry of Minerals, Energy, and Water Resources, an Environmental Impact Assessment (EIA) approval from the Department of Environmental Affairs, ensuring the project adheres to environmental standards.

Other critical primary approvals include water use permits from the Water Apportionment Board and land-use agreements from local Land Boards. Community engagement with local leaders to secure a social license to operate is also essential. These approvals form the foundation for legal compliance and operational permissions

17.2.2 Secondary Approvals

Secondary approvals typically involve several permits and compliance measures to ensure safe and responsible operations. These may include permits for infrastructure development, such as road construction or power supply, which require approvals from relevant municipal or regional authorities. Environmental management plans (EMPs), detailing ongoing monitoring and mitigation strategies, must be submitted for approval to ensure that environmental impacts are effectively managed throughout the project lifecycle.

Additionally, permits related to air quality monitoring, waste management (for the disposal of chemical residues and leaching fluids), and occupational health and safety regulations are required to comply with both national and international standards.

Coordination with agencies responsible for wildlife protection, especially in sensitive areas like the Kalahari, may also be necessary to avoid disrupting local ecosystems. These secondary approvals ensure that all ancillary activities align with the primary objectives of minimising environmental impacts and maintaining social responsibility throughout the project's duration.

Table 17-1: Permits

Approval Type	Authority	Legislation (Botswana)	Description	Key Requirements	Timeframe[1]
Primary Approvals					
Environmental Impact Assessment (EIA)	Department of Environmental Affairs (DEA)	Environmental Assessment Act, 2011 (Cap 65:07)	Mandatory assessment to identify, evaluate, and mitigate environmental impacts.	Submission of an EIA report, including baseline studies, impact assessment, and mitigation measures.	12-18 months (varies with complexity)
Environmental Management Plan (EMP)	Department of Environmental Affairs (DEA)	Environmental Assessment Act, 2011	Plan outlining the mitigation, monitoring, and management of environmental impacts throughout the project lifecycle.	Development of a detailed EMP based on EIA findings, covering mitigation measures, monitoring, and compliance strategies.	Integrated into EIA process
Environmental Authorization	Department of Environmental Affairs (DEA)	Environmental Assessment Act, 2011	Authorisation required to commence development after EIA approval.	EIA approval, compliance with conditions set by DEA.	Following EIA approval
Mining License	Ministry of Mineral Resources, Green Technology, and Energy Security	Mines and Minerals Act, 1999	License required to explore and extract minerals.	Proof of mineral rights, EIA approval, and development plan.	12-18 months (varies with complexity)
Water Use Permit	Department of Water Affairs	Water Act, 1968	Permit for the use of water resources, particularly important for leaching operations.	Detailed hydrogeological studies, water usage plan.	12-18 months (varies with complexity)
Land Use Permit	Land Board or Ministry of Land Management	Tribal Land Act, 1968	Permit required for the use of land for mining activities.	Land allocation, compliance with zoning regulations.	6-12 months (varies with complexity)
Secondary Approvals					
Waste Management Permit	Department of Waste Management and Pollution Control	Waste Management Act, 1998(Cap 65:06)	Permit for the management, treatment, and disposal of mining waste, including tailings and leachate.	Waste management plan, compliance with national regulations.	6-12 months
Air Quality Permit	Department of Waste Management and Pollution Control	Atmospheric Pollution (Prevention) Act, 1971	Permit to ensure compliance with air quality standards, particularly for dust and emissions control.	Air quality impact assessment, mitigation measures.	6-12 months
Hazardous Substances Permit	Ministry of Health and Wellness	Mines, Quarries, Works and	Permit for the storage, handling, and disposal of hazardous substances	Safety and handling procedures, storage facility compliance.	3-6 months

[1] Assessment timeframe indicative only. Does not include time period for development of required documents/submissions

Approval Type	Authority	Legislation (Botswana)	Description	Key Requirements	Timeframe[1]
		Machinery Act (Cap 44:02) Environmental Assessment Act (Cap 65:07)	used in the leaching process.		
Community Development Agreement	Local Authorities/ Community Representatives	Mines and Minerals Act, 1999	Agreement with local communities outlining benefits, compensation, and development projects.	Stakeholder consultations, agreement terms.	Variable, depending on negotiations
Rehabilitation and Closure Plan	Ministry of Mineral Resources, Green Technology, and Energy Security	Mines and Minerals Act, 1999	Plan outlining the rehabilitation of the mining site after operations have ceased.	Detailed closure plan, financial provision for rehabilitation.	3-6 months

18. HUMAN RESOURCES

18.1 Botswana Labour Market Analysis

18.1.1 National Labour Market Overview

Botswana’s labour market is characterised by a mix of formal and informal employment, with a significant portion of the population engaged in agriculture, services, and mining sectors. Based on 2023 figures the countries unemployment rate of year 2023, Botswana's unemployment rate is estimated at around 24.5%, indicating that nearly 1 in 4 people of working age are not employed. The labour force participation rate stands at approximately 65%, with notable gender disparities as women are less represented in the formal workforce compared to men.

Education levels in Botswana have seen considerable improvement over the years, with the government investing heavily in educational infrastructure and access. The literacy rate is above 85%, and the country has a relatively high secondary school enrolment rate. However, there is a gap between educational attainment and employment, leaving many graduates facing difficulties in securing jobs that match their qualifications. There is a need for alignment between educational outcomes and labour market demands, especially in technical and vocational training.

Key industries in Botswana include mining, particularly diamond mining, which remains the backbone of the economy, contributing significantly to GDP and employment. The service sector, including tourism and financial services, also plays a vital role, followed by agriculture, which, although less dominant in terms of GDP contribution, is crucial for rural employment.

18.1.2 Regional Labour Market Conditions

The region surrounding the Cobre Ngami ISCR project in Botswana presents a labour market with distinct characteristics compared to the national overview. The local economy is predominantly rural, with subsistence farming and small-scale trading being common sources of employment. However, the mining sector has a noticeable presence, attracting workers from various parts of the country.

Local employment rates vary, with a significant portion of the working-age population engaged in informal or low-skilled jobs. The region has a lower unemployment rate compared to the national average, partly due to the mining activities and related industries. However, these jobs are often low-paying and lack job security, reflecting the broader challenges of informal employment.

Key skills in the region are largely centred around mining, agriculture, and basic trade. However, there is a shortage of highly skilled labour, particularly in technical and engineering roles essential for mining operations. This shortage is exacerbated by the migration of skilled workers to urban centres or other regions with better job opportunities.

18.1.3 Skill Availability and Gaps

The local and national workforce in Botswana exhibits a range of skills, but there are notable gaps that could impact the successful implementation of the project. At the national level, there is a relatively strong pool of semi-skilled labour, particularly in mining-related fields, due to the country's long history with the diamond industry. However, the specific skills required for mining, such as specialised engineering, hydrologists, geoscience, and environmental management expertise, are less abundant.

In the region surrounding the project, the skill availability is more constrained. While there is a workforce experienced in basic mining operations, the availability of advanced technical skills, such as metallurgy, advanced machinery operation, and mining safety management, is limited. This gap presents a challenge for the project but also an opportunity to invest in local training and development programs.

Addressing these skill gaps will likely require a combination of strategies, including partnerships with local educational institutions to tailor curricula to the needs of the mining sector, on-the-job training programs, and the recruitment of skilled professionals from other regions or countries. Developing a local workforce with the necessary skills will not only benefit the project but also contribute to the long-term economic development of the region. Suitable integration of a fly in-fly out (FIFO) or drive in-drive out (DIDO) workforce to the region and communities will also be important.

18.2 Workforce Requirements

The proposed number of employees required for each department of the Cobre Ngami ISCR project at stage 1 and stage 2 is shown in Table 18-1. A detailed employee list is available in the Appendix I.

Table 18-1 Number of Cobre Ngami ISCR Project Employees

Operation Department	Stage 1	Stage 2
General and Administration	11	11
Environment and Safety	9	9
Logistics and Procurement	9	9
Processing	32	33
ISCR Operation	18	35
Maintenance	9	17
Total	**88**	**114**

The operations phase will cover the lifespan of the ISCR project. The direct workforce during first phase is estimated to include 88 direct employees and second phase 114. Please note indirect/contractor jobs such as camp accommodation, canteen, medical personnels are not included in this employee list.

Majority of the direct workforce will be mining site based on the FIFO/DIDO schedule of 8 days on/ 6 days off. Based on the proposed employee list, it is recommended that the site camp should be able to accommodate 90 employees Also please note indirect employees are not included).

This direct workforce will include drilling engineers (or drilling contractors), geologists, metallurgists, mechanics, maintenance technicians, safety managers, environmental officers etc. Additionally, there will be ongoing needs for administrative roles, including HR managers, accountants, and IT support. Some of these administrative personals may be located in head office and rotated onsite as needed.

An example of the expected specific skills for part of the roles shown in Table 18-1 above is as follows:

- Geologists: Expertise in mineral exploration, geological mapping, and ore body modelling, resource estimation. Ability to assist with technical advice regarding the geology as needed by drilling contractors with the development of injection and extraction wells. Provide metallurgists with geology and mineralogy input as required.
- Drilling engineers and hydrologists: Knowledge of in-situ leaching drill hole planning, and ISR operations management including in-situ solution flows through the orebody. Competency in using specialised software for drilling and experience in the use of directional drilling procedures. Due to the highly specialised nature of the expertise required this work is likely to be assisted by contractors and consulting firms.
- Metallurgists: Understanding of the hydrometallurgy processes for copper leaching and extraction. Experienced in copper extraction methods including a proven track record to produce high purity grade copper product and competency in process optimisation and quality control. Metallurgists are responsible for the day-to-day monitoring of the ISR field, conducting metallurgical testwork associated with drill hole development and field monitoring for kinetics, recovery and reconciliation during production.
- Operators and maintenance personal: This will involve the necessary skills for both fixed plant (process plant, pumps, pipelines, water treatment and building maintenance.) and mobile plants (site trucks, mobile cranes and equipment and auxiliary vehicles). It is anticipated that the drilling contractor will be responsible for the maintenance of their own equipment including drill rigs It is suggested that appropriated consideration is given to the hiring of operator maintainer ‘s for both ISR operations and the process plant. Other additional operators can be sources locally and trained accordingly.
    - Operator maintainers: they are highly multi skilled operators with the skills set to perform minor running repairs as needed when applicable in the processing plant and wellfield. This may serve as an emergency fix until the appropriate maintenance or maintenance personal can tend to the task. They also serve as a good source of training particularly when using lower skilled workforces due to their depth and wealth of experience. Their expertise is invaluable in providing training on the job.

- Safety Managers: Strong background in occupational health and safety, risk assessment, and emergency response planning. Knowledge of mining safety regulations and practices.
- Environmental Officers: Competency in environmental monitoring, compliance with environmental regulations, and management of waste and pollution control systems.

18.3 Recruitment Strategies

18.3.1 Local vs. Expatriate Workforce

18.3.1.1 Local Workforce

Leveraging the local workforce is critical for ensuring that the project supports the community's economic well-being and fosters positive relations with stakeholders. The local workforce brings several advantages, including a deep understanding of the local culture, language, and environment, which can be invaluable in day-to-day operations and community engagement. Moreover, employing locals contributes to the regional economy, helps reduce unemployment, and importantly can enhance the social license to operate by demonstrating the project's commitment to the community.

However, challenges arise from the limited availability of specialised skills required for advanced mining operations. While Botswana has a solid base of semi-skilled workers, especially those with experience in diamond mining, the specific skills required for mining, such as advanced metallurgy, hydrology and hydrogeology, geotechnical engineering specialised drilling, and environmental and safety management may be in short supply locally. This gap highlights the need for substantial investment in training and development to build a skilled local workforce capable of meeting the project's demands over time.

18.3.1.2 Expatriate Workforce

Expatriate workforce will be essential when highly specialised skills and expertise are critical. Expatriates, consultants and contractors can fill gaps in technical and managerial positions where local expertise is not yet available. They can also transfer knowledge and best practices to local workers, contributing to skill development and capacity building.

The use of expatriates, however, can be costly and may lead to perceptions of inequality or missed opportunities for local workers. To mitigate these concerns, the project should aim to reduce the reliance on expatriates over time, prioritising the transfer of knowledge and skills to local employees. A phased approach, where expatriates are gradually replaced by trained locals, can help in achieving this balance where possible.

18.3.2 Recruitment Channels and Partnerships

Effective recruitment channels and partnerships are vital for attracting and retaining the right employees. These channels should be diverse, targeting both local talent and specialised professionals from abroad.

18.3.2.1 Local Recruitment Channels

Local Employment Agencies: Collaborating with local employment agencies can help in identifying and recruiting semi-skilled and unskilled labour from nearby communities. These agencies are familiar with the local job market and can assist in matching candidates with available roles.

Educational Institutions: Partnering with local universities, technical colleges, and vocational training centres is crucial for sourcing young talent and developing the specific skills required for the mining industry. Internships, apprenticeships, and scholarship programs can be established to create a pipeline of future employees.

Community Engagement: Engaging directly with local communities through job fairs, informational sessions, and community meetings can help raise awareness about employment opportunities and attract potential candidates from the region. This approach also enhances transparency and trust between the project and the local population.

18.3.2.2 Expatriate Recruitment Channels

Global Recruitment Firms: For specialised roles that cannot be filled locally, the project can collaborate with international recruitment firms that have expertise in sourcing talent from the global mining industry. These firms can assist in identifying expatriates with the necessary technical skills and experience.

Professional Networks and Industry Associations: Leveraging professional networks and industry associations, such as the Southern African Institute of Mining and Metallurgy (SAIMM) or international mining conferences, can help in attracting top talent from around the world. These platforms can be used to advertise job openings and connect with potential candidates.

Government and Industry Partnerships: Forming partnerships with government bodies, such as Botswana's Ministry of Employment, Labour Productivity, and Skills Development, can facilitate access to government-supported training programs and initiatives that align with national employment policies. Collaboration with industry groups can also provide access to a broader pool of skilled workers and resources.

18.3.3 Employment Policies and Procedures

To ensure a fair, inclusive, and effective recruitment process, comprehensive employment policies and procedures that align with best practices and local regulations are required.

By implementing these employment policies and procedures, the ISCR project in Botswana can create a positive and productive work environment that attracts top talent, supports local development, and aligns with ethical and legal standards.

18.3.3.1 Equal Opportunity and Non-Discrimination

Equal opportunity policy should be committed in all aspects of employment, ensuring that recruitment, hiring, promotion, and compensation practices are free from discrimination based on gender, race, ethnicity, religion, age, disability, or any other protected characteristic. This commitment should be reflected in the recruitment process, with diverse candidate pools actively sought and evaluated based on merit and qualifications.

18.3.3.2 Training and Development

To address skill shortages and promote career advancement, the project should establish comprehensive training and development programs for both local and expatriate workers. These programs could include on-the-job training, mentorship schemes, and partnerships with educational institutions to offer industry-specific courses. By building a skilled workforce, the project not only enhances its operational efficiency but also contributes to the long-term development of the local community.

18.3.3.3 Health, Safety, and Welfare

Employment policies must prioritise the health, safety, and welfare of all employees. This includes implementing robust health and safety protocols in line with international standards, providing regular safety training, and ensuring access to healthcare and well-being programs. Additionally, the project should offer fair wages, benefits, and working conditions that meet or exceed industry standards.

18.3.3.4 Employee Grievance and Feedback Mechanisms

A transparent and accessible grievance and feedback mechanism should be established to address employee concerns and disputes. This mechanism should allow employees to raise issues without fear of retaliation and ensure that complaints are resolved fairly and promptly. Regular employee surveys and feedback sessions can also be conducted to gauge job satisfaction and identify areas for improvement.

18.4 Workforce Development Initiatives

18.4.1 Skill Development Programs

Skill development is a cornerstone of the Cobre Ngami ISCR project in Botswana, aimed at creating a capable and efficient workforce that can meet the demands of the industry. Given the specialised nature of ISCR and downstream processing, comprehensive training programs are essential to equip the employees with the necessary skills and knowledge to perform their roles effectively and safely.

18.4.1.1 Customised Training Programs

The project will implement customised training programs tailored to the specific needs of different job roles within the operation. These programs will cover a range of competencies, from basic operational skills to advanced technical expertise. Training modules will include:

- **Mining Operations:** Courses on the fundamentals of copper ISCR, including the geology of copper deposits, drilling techniques, ore extraction methods with a focus on ISCR, and copper mineral processing.
- **Technical Skills:** Training on the use of specialised ISCR mining equipment. Operators will receive hands-on experience with the machinery they will use daily, ensuring they can operate it efficiently and safely.
- **Health and Safety:** Given the inherent risks associated with the project, safety training will be a priority. Programs will cover occupational health and safety

standards, risk management, emergency response procedures, and the use of personal protective equipment (PPE).

- **Environmental Management:** Employees will be trained on environmental regulations, waste management practices, and sustainable mining techniques to minimise the environmental impact of the operation.
- **Leadership and Management:** For supervisory and managerial staff, training will focus on leadership skills, team management, project planning, and decision-making processes.

18.4.1.2 Partnerships with Educational Institutions

To enhance the effectiveness of these programs, the project can collaborate with local and international educational institutions. These partnerships will facilitate the development of curricula that align with industry standards and ensure that training programs are recognized and accredited.

Institutions such as the Botswana International University of Science and Technology (BIUST) and the Botswana College of Engineering and Technology (BCET) can be key partners in delivering these programs.

18.4.1.3 Technology-Enhanced Learning

Incorporating technology into skill development is crucial for keeping the workforce up to date with the latest industry advancements. It's recommended that Cobre's Ngami ISCR project can apply leverage e-learning platforms and interactive training modules to provide flexible and accessible learning opportunities. This approach allows employees to learn at their own pace and revisit material as needed.

18.4.2 Continuous Professional Development (CPD)

Continuous Professional Development (CPD) is essential to ensure that the workforce remains skilled, adaptable, and capable of meeting the evolving demands of the copper mining industry. CPD programs will be integral to the project's long-term success, fostering a culture of lifelong learning and professional growth.

18.4.2.1 Ongoing Training and Certification

To keep the workforce up to date with the latest industry trends, technologies, and regulations, the project will offer ongoing training and certification opportunities. These programs will be available to all employees, from entry-level workers to senior management, and will cover a wide range of topics, including:

- **Advanced Technical Skills:** Employees will have the opportunity to participate in advanced training courses that build on their existing knowledge and skills. This may include specialised training in areas such as automation, data analysis, and new mining technologies.
- **Leadership Development:** For employees in supervisory and managerial roles, leadership development programs will be offered to enhance their skills in team management, strategic planning, and decision-making. These programs will be

designed to prepare employees for higher-level responsibilities and career advancement.

- **Regulatory Compliance:** Regular training on local and international regulations, including health and safety, environmental standards, and labour laws, will ensure that the workforce remains compliant with all legal requirements.
- **Professional Certifications and Accreditations:** This project will support employees in obtaining professional certifications and accreditations that are recognised within the mining industry. This could include certifications from industry bodies such as the Southern African Institute of Mining and Metallurgy (SAIMM), the International Council on Mining and Metals (ICMM). Australasian Institute of Mining and Metallurgy (AUSIMM) is also a potential institute for Cobre. Obtaining these certifications not only enhances the employee's professional credentials but also contributes to the overall credibility and reputation of the project.

18.4.2.2 Learning and Development Resources

The project will provide access to a range of learning and development resources, including online courses, industry publications, and professional development workshops. Employees will be encouraged to take advantage of these resources to continue their education and stay informed about the latest developments in the mining industry.

18.4.2.3 Career Development Planning

Each employee will have access to personalised career development planning, where they can set professional goals and identify the skills and experiences needed to achieve them. Managers will work with employees to create a development plan that includes relevant training, mentorship, and job assignments that align with their career aspirations.

18.4.2.4 Knowledge Sharing and Collaboration

To foster a culture of continuous learning, the project will encourage knowledge sharing and collaboration among employees. This can be facilitated through regular workshops, seminars, and internal conferences where employees can share their experiences, insights, and best practices. Creating a collaborative environment helps to spread knowledge across the organisation and ensures that all employees can learn from one another.

18.4.3 Apprenticeships and Internships

Apprenticeships and internships are vital components of the project's workforce development strategy, particularly in fostering the growth of local talent and addressing skill shortages.

18.4.3.1 Apprenticeship Programs

The project can establish apprenticeship programs that offer hands-on training and mentorship to young people from local communities. These programs will typically last between one to three years, depending on the complexity of the trade, and will be designed to provide apprentices with a comprehensive understanding of the mining industry.

Content of the apprenticeship may include:

- **Structured Learning**: Apprentices will split their time between classroom instruction and on-the-job training, allowing them to apply theoretical knowledge in a practical setting. They will work alongside experienced professionals who will mentor them and provide guidance on industry best practices.
- **Specialised Trades**: The apprenticeship programs will focus on key trades essential to mining operations, such as mechanical and electrical maintenance, welding, drilling, and heavy machinery operation. These trades are in high demand and offer apprentices valuable skills that can lead to long-term employment opportunities within the industry.
- **Certification**: Upon completion of the apprenticeship, participants will receive a recognised certification, enhancing their employability both within the project and in the broader mining sector.

18.4.3.2 Internship Opportunities

Internships can be offered to students and recent graduates from local universities and technical colleges. These internships will provide participants with exposure to the mining industry and the opportunity to gain practical experience in their field of study.

The internship program can offer:

- **Industry Exposure**: Interns will rotate through different departments, such as geology, environmental management, and engineering, to gain a holistic understanding of the mining process. This rotational model helps interns identify their areas of interest and specialisation.
- **Mentorship and Networking**: Interns will be paired with mentors who will guide their professional development and help them navigate the early stages of their careers. Additionally, the project will host networking events and workshops to connect interns with industry professionals and potential employers.
- **Career Pathways**: Successful interns may be offered full-time positions within the project upon completion of their internships, providing a direct pathway from education to employment. This approach not only benefits the project by securing a pipeline of skilled workers but also contributes to local economic development by creating job opportunities for youth.

19. PROJECT EXECUTION

This project execution chapter details the systematic steps required to transition Cobre's copper deposit in Botswana from exploration and concept stages to a fully-fledged mining operation. This involves a rigorous process of exploration, hydrology and hydrogeology studies, metallurgical testwork, design criteria and development, piloting along with a rigorous permitting phase achieving construction, commissioning and operation of Cobre's Ngami ISCR Project in Botswana.

19.1 Exploration and Metallurgical Testwork

The geological exploration, hydrology and hydrogeology studies along with metallurgical testwork are critical for determining the viability and potential of the copper mining project in Botswana. This phase involves a detailed analysis of the geological and metallurgical characteristics of the ore body.

19.1.1 Geological Exploration and Hydrogeology Study

Geological exploration involves detailed mapping, sampling, and drilling activities to determine the size, grade, and distribution of copper ore deposits and any other possible target minerals of interest. Advanced geophysical techniques, such as magnetic and gravity surveys, are often employed to identify promising areas for further investigation.

In Botswana, the geological exploration phase is supported by the country's rich mining history and well-documented mineral resources, with the geological setting of the Kalahari Copper Belt conducive to the formation of large, high-grade copper deposits. The belt's stratigraphy and structural controls are like those found in other major copper-producing regions, such as the Central African Copperbelt. The sediment-hosted nature of the copper deposits, combined with the region's complex geological history, provides a favourable environment for the accumulation of significant copper resources.

Preliminary Hydrology studies indicate groundwater depths ranging from 95 to 117 meters below the surface within fractured rock aquifers of the D'Kar and Ngwako Pan Formations. Cobre's project location area is characterised by unconsolidated and semi-consolidated Kalahari Sands acting as overburden with a thickness of around 70 meters. The presence of folded anticlinal structures and the contact zone between the Ngwako-Pan and D'Kar Formations play a crucial role in controlling groundwater flow and mineralisation. The significant depth to groundwater allows for higher injection rates with minimal risk of leakage into overlying sands, though potential leakage needs assessment. The copper mineralisation is hosted in relatively porous fractures, with groundwater flow likely exhibiting anisotropy, favouring flow along strike due to the folded structures and varying fracture orientations. The potential exists to manipulate the water table to access copper mineralisation above it, with lateral continuity of groundwater flow and mineralisation across the anticline's limbs.

19.1.2 Metallurgical Testwork

Metallurgical testwork using drilling samples acquired from Cobre's geological exploration operations focuses on understanding the ore's properties and how it responds to the extraction process.

After conducting a trade-off study considering research, geology, hydrology, geological structure, resources and mineralisation of the Cobre's ore body, in-situ copper recovery (ISCR) method was identified as the preferred option.

The ISCR testwork programme at the laboratory includes mineralogy examination, bottle roll tests, leach box tests and packed column leach tests to determine the amenability and provide early-stage guidance for in-situ leaching recoveries and kinetics for copper and silver extraction.

Key component of the ISCR testwork programme will include:

- **Mineralogy Examination**: This step involves detailed microscopic and mineralogical analyses of the samples to identify the types and distribution of copper minerals. Understanding the mineralogy is crucial for predicting how the ore will react to leaching solutions and identifying any potential challenges in the extraction process. Understanding the mineralogy of the silver minerals in the orebody and their association with the chalcocite is also important to the operation.
- **Bottle Roll Tests**: These are small-scale tests where ore samples are mixed with leaching solutions in a rotating bottle to simulate to assess leachability and provide a baseline recovery. Bottle roll tests provide initial insights into the leaching behaviour of the ore, including the rate of copper and silver dissolution, and help in determining the most effective leaching agents and conditions for further assessment.
- **Leach Box Tests**: Leach box tests are performed on uncrushed drill core packed tightly within a confined space providing more detailed data on the leaching kinetics and metal recovery rates that is more applicable to the in-situ leaching process. These tests help refine the leaching parameters and provide a better representation of how the ore will behave; this will aid the establishment of modelling data.
- **Packed Column Leach Tests**: the column tests are similar to leach box tests and will be conducted on uncrushed core as provided, with interstices filled with inert sand as per the leach box tests. These tests also mimic the conditions of in-situ leaching and are crucial for understanding the long-term leaching behaviour, recovery rates

The results from these initial tests are critical for assessing the feasibility of in-situ copper recovery for the ore body. They provide early-stage guidance on the expected recoveries and kinetics of copper and silver extraction, helping to identify any potential technical challenges that might arise. Additionally, these results inform the design of future testwork and pilot trials, which are essential for refining the ISCR process and scaling it up to commercial levels.

On a sidenote, this testwork will provide Cobre guidance to conduct onsite metallurgical testwork that can be routinely applied to representative samples from exploration drill holes and /or from material collected during the drilling of injection and extraction wells to obtain information about leaching kinetics and recoveries in advance of actual ISCR aiding the development of leaching models and predictive tools for financial modelling. This will aid metallurgical testwork recovery mapping of the field along with geological and geochemistry information, all of which aids reconciliation associated with ISCR.

19.1.3 ISCR Pilot Plant Development

The pilot plant for developing a small-scale in-situ copper recover (ISCR) field at the project location and the laboratories is a critical step in evaluating the feasibility of ISCR. This pilot plant serves as a scaled-down version of a full-scale ISCR operation, allowing for the testing and optimisation of key processes before committing to large-scale production.

A Pilot scale ISCR is essential in supporting engineering studies and designs, reducing risks and ensuring a smooth transition to operations. It may also be required for final permitting and licensing requirements including proving that the field can be returned to original groundwater quality and conditions.

The primary purpose of the pilot plant is to assess the technical and economic viability of using ISCR for copper extraction, with following objectives:

- Testing ISR leaching process,
- Permeability and flow testing,
- Recovery and process efficiency,
- Environmental impact assessment.
- Licensing and permitting requirements.

Design and infrastructure of the pilot plant should include the following ISCR operation sections:

- Wellfield,
- Application of specialised and experimental drilling methods/trials,
- Leach solution preparation,
- Pipeline and pumping system for ISCR injection and recovery,
- Monitoring and control systems,
- Environmental protection infrastructure including monitoring wells.

Operating time of the pilot plant could last for several months or more, allowing for collection of sufficient data to evaluate the ISCR process. Various parameters will be evaluated and adjusted, including solution concentrations, suitable well distances, injection and recovery rates, and cycle time intervals.

The results of the pilot plant operations are analysed to determine the feasibility of scaling up the ISR process to a commercial level. Key factors considered include copper recovery rates, operational costs, environmental impacts, and overall economic viability. A successful pilot plant test can lead to the design and development of a full-scale ISCR field.

19.2 Engineering Studies

Engineering studies and design are conducted to establish the technical and financial feasibility of the mining project. These studies are iterative and become more detailed as the project progresses. Table 19-1 below shows the project development timeline estimation for the Cobre ISCR project.

Table 19-1 Project Development Timeline for the Cobre ISCR Project Engineering Studies

Engineering Study Level	Accuracy	Contingency	Percent of Engineering Complete	Cost As Percentage of Plant Cost	Timeline Estimation
Scoping Study	50%	20-30%	0-1%	0.01%	This Report
Pre-Feasibility Study	20-25%	15-20%	2-5%	0.02-1%	6-18 months
Feasibility Study	10-15%	10-15%	8-15%	0.25-2.5%	12-24 months
Definitive Feasibility Study	5-10%	5-10%	35-45%	2-6%	12-24 months

After the finish of engineering studies above, a 12-to-24-month FEED (front end engineering design) study is required prior to construction.

It is estimated that approximately 4 to 6 years are required to complete all engineering studies before construction.

19.2.1 Trade-Off Study

A trade-off study evaluates different technical options for various aspects of the project, such as mining methods, processing technologies, and infrastructure requirements. The objective is to select the most cost-effective and technically feasible option that maximises the project's economic returns while minimising risks.

The trade-off study conducted in July 2024 identified the recommended mining method for the Cobre NCP deposit to be in-situ copper recovery (ISCR).

The trade-off study reviewed open pit and underground mining along with heap leaching and in-place leaching. ISCR is the preferred option at this stage as extraction of the ore via open pit mining and heap leaching or the establishment of underground mining operations for in place leaching has been ruled out due to considerable over burden of the Kalahari sands and calcrete, high strip ratios, low grade of the current resources impacting the economic viability of these options. The initial hydrology studies indicating suitable fractures and solution flow through the mineralised orebody are very encouraging for the establishment of an ISCR operation.

19.2.2 Scoping Study

The scoping study, also referred to as the conceptual study, is the earliest formal evaluation of a project’s potential. It serves as a broad-based assessment of the viability of the mineral resource and the project's economic potential. Key elements evaluated include solution mining methods, processing options, and an initial estimate of capital (CAPEX) and operating costs (OPEX).

At this stage, data is typically incomplete or inferred, so assumptions are made based on available information. The goal of a scoping study is to provide sufficient data to decide whether advancing to more detailed stages of study is justified. This document helps stakeholders gauge the project’s general prospects, with the understanding that substantial additional work will be required to firm up the assumptions made.

While the scoping study isn't intended for investment decisions, it plays a crucial role in setting the stage for further exploration and development, highlighting areas where further technical, environmental, or economic investigation is needed.

19.2.3 Pre-Feasibility Study (PFS)

The Pre-Feasibility Study (PFS) builds upon the findings of the scoping study and narrows the focus to specific mining methods and processing flowsheets. The PFS aims to determine whether the project has the potential to be technically and economically viable at a higher level of detail. This study involves further resource drilling, more accurate metallurgical testwork, and improved geotechnical assessments.

During the PFS, mining and processing plans are developed, and different capital cost (CAPEX) scenarios and operating cost (OPEX) forecasts are evaluated in greater detail. Key considerations such as infrastructure needs, water and power supply, transportation logistics, and environmental baseline studies are initiated.

The PFS also introduces economic modelling to evaluate various financial scenarios and sensitivities, such as commodity prices, operating margins, and project financing needs. The findings of the PFS guide whether to proceed to the more capital-intensive Feasibility Study (FS). A positive PFS provides confidence in the project’s potential, allowing for more substantial stakeholder engagement, and is often used as a basis for initial discussions with potential investors and lenders.

19.2.4 Feasibility Study (FS)

The Feasibility Study (FS) represents the most comprehensive and detailed analysis of the project. It takes the preliminary data and conclusions from the PFS and further refines them into a fully detailed, bankable document. This study includes detailed engineering designs for the entire project, including the mine site layout, infrastructure requirements, and processing facilities.

Cost estimates are significantly more accurate at this stage, typically with a ±10-15% margin of accuracy, and include breakdowns for all aspects of the project, from mining operations to environmental compliance. Detailed financial models are also created, incorporating variables such as taxation, royalties, and financing options.

The FS is not just a technical exercise; it also identifies potential risks, whether technical, financial, environmental, or social, and provides mitigation strategies for each. Permitting requirements and compliance issues are fully addressed, and community engagement plans are refined.

A positive feasibility study is a critical milestone for the project, as it is typically required by lenders and investors to secure project financing. It represents the last major hurdle before moving into detailed engineering and construction.

19.2.5 Definitive Feasibility Study (DFS)

The Definitive Feasibility Study (DFS) is the final stage of project evaluation, offering a detailed and precise assessment of the project's technical, financial, and operational aspects. It builds on the findings of the Feasibility Study, refining all elements to reduce uncertainties and risks to a minimum. The DFS provides a complete set of engineering designs, including finalised plans for the mine, processing plant, and infrastructure. Cost estimates at this stage are highly accurate, allowing for precise budgeting and financial planning.

The DFS also includes a thorough analysis of potential risks, with detailed strategies for mitigating any identified issues. This study incorporates comprehensive financial models, analysing the project's profitability under various scenarios and ensuring that investment decisions are well-informed. A project execution plan, including timelines for construction and procurement, is also finalised, ensuring that the project is ready to move efficiently into the construction phase. A positive DFS is crucial for securing financing, giving investors and lenders confidence in the project's viability.

19.2.6 Front End Engineering Design (FEED)

The Front-End Engineering Design (FEED) stage involves detailed planning and technical design of all aspects of the project, focusing on the ISR (in-situ recovery) mining field and the associated processing plant. During FEED, the engineering specifications are refined down to the smallest detail, ensuring that all technical challenges are addressed before construction begins.

This phase includes the selection of equipment, specification of required materials, and the finalisation of the plant layout. Engineering teams develop detailed piping and instrumentation diagrams (P&IDs), mechanical designs, civil layouts, and electrical engineering plans to guide the construction teams. The output from the FEED process serves as a blueprint for the project's execution phase, ensuring that costs and timelines are well controlled.

By the end of the FEED phase, the project team will have a detailed design package that provides clear and executable plans for the construction, procurement, and installation of the project's assets. The FEED also informs the creation of tender packages for major contracts and ensures that procurement processes can begin efficiently.

19.2.7 Environmental and Social Impact Assessment (ESIA)

The ESIA assesses the potential environmental and social impacts of the mining project. It involves stakeholder consultations, baseline studies, and the development of mitigation measures to minimise adverse effects. In Botswana, conducting a thorough ESIA is crucial for obtaining regulatory approvals and maintaining social license to operate.

Considering the nature of ISR method and complexity of the ESIA process for this type of mining projects, it is recommended to allocate decent lead up time to prevent unnecessary delays to the project execution. This will involve ensuring adequate community engagement and a high focus on social licensing.

19.3 Project Implementation

The project implementation phase involves turning the plans and designs into reality. It includes the scheduling, procurement, and construction activities necessary to build the ISR field and processing facilities.

19.3.1 Project Scheduling

Project scheduling involves the development of a detailed timeline for all activities, from initial construction to the start of production. This schedule is essential for ensuring that the project stays on track and within budget.

19.3.2 Procurement and Contracting

Procurement and contracting involve the acquisition of equipment, materials, and services needed for the project. This phase includes selecting contractors, negotiating contracts, and managing supply chains to ensure that all necessary resources are available when needed. The use of an experienced, specialised drilling contractor is essential for the success of this project.

19.3.3 Construction and Implementation

Construction and implementation involve the actual building of the ISCR operation which constitutes the solution mining operations, processing plant, and associated infrastructure. This phase includes earthworks, structural construction, and the installation of equipment. Effective project management during this phase is crucial for maintaining timelines and budget controls.

19.4 Operational Readiness and Handover

Operational readiness and handover ensure that the project is ready to move from construction to production. This phase involves preparing the workforce, establishing operational systems, and formally transferring the project to the operations team.

19.4.1 Workforce Training and Development

Workforce training and development are critical for ensuring that the operations team is equipped with the skills and knowledge needed to run the ISCR field and processing plant efficiently. Training programs focus on safety, operational procedures, and technical skills.

19.4.2 Operational Systems and Procedures

Operational systems and procedures are developed to guide the day-to-day operations of the ISCR project. These include maintenance schedules, safety protocols, and quality control measures. Establishing robust systems is essential for ensuring consistent and safe operations.

19.4.3 Project Handover

Project handover is the formal transfer of the project from the construction team to the operations team. This process includes the completion of all construction activities, final inspections, and the handover of documentation and operational systems. A smooth handover is critical for a successful transition to production.

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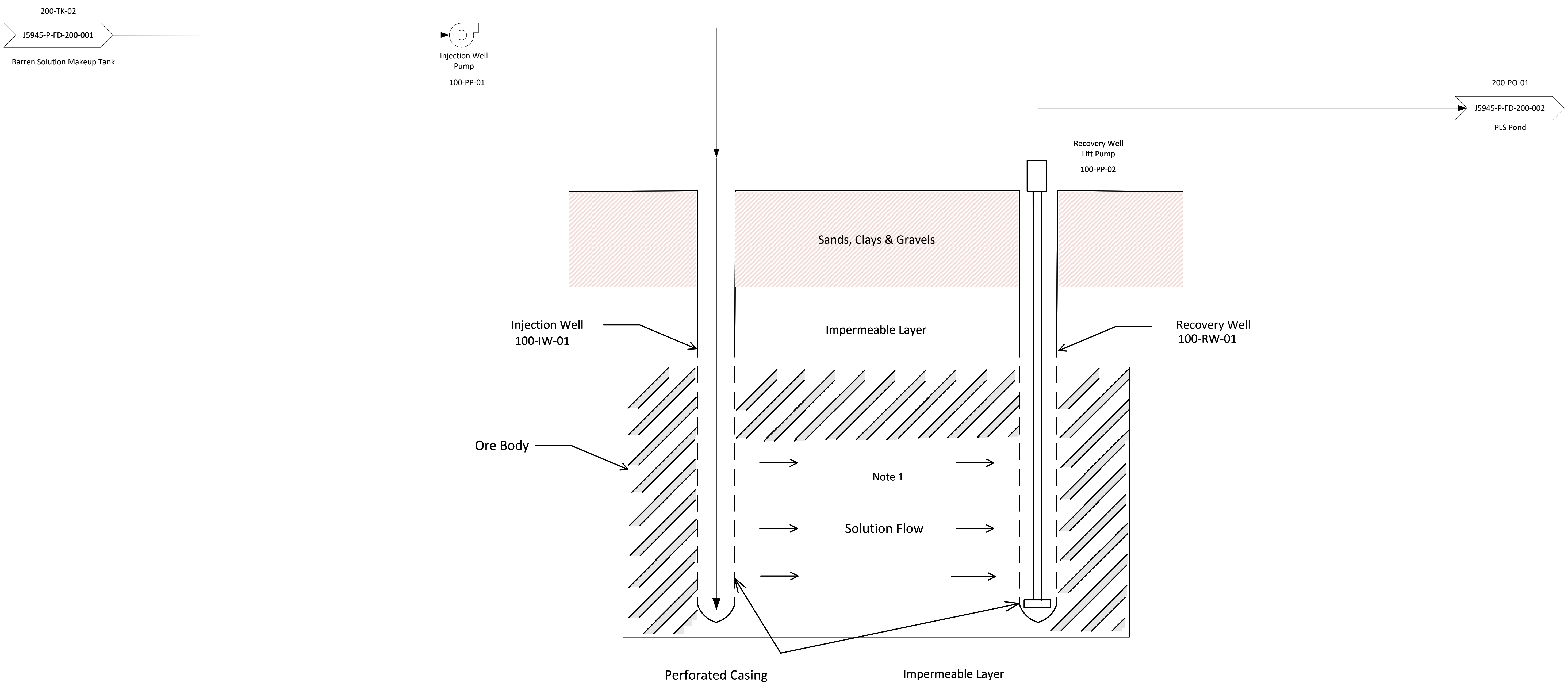
APPENDIX A – Process Flowsheet

Appendix items



Notes

1. Injection and recovery wells are for illustrative purposes only. There will be more than one injection/recovery wells.

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TITLE: Process Flow Diagram
In Situ Copper Recovery (ISCR)

AREA: 100
SECTION: In Situ Copper Recovery (ISCR)
SHEET: 1 of 1

DRAWING NO. J5945-P-FD-100-001

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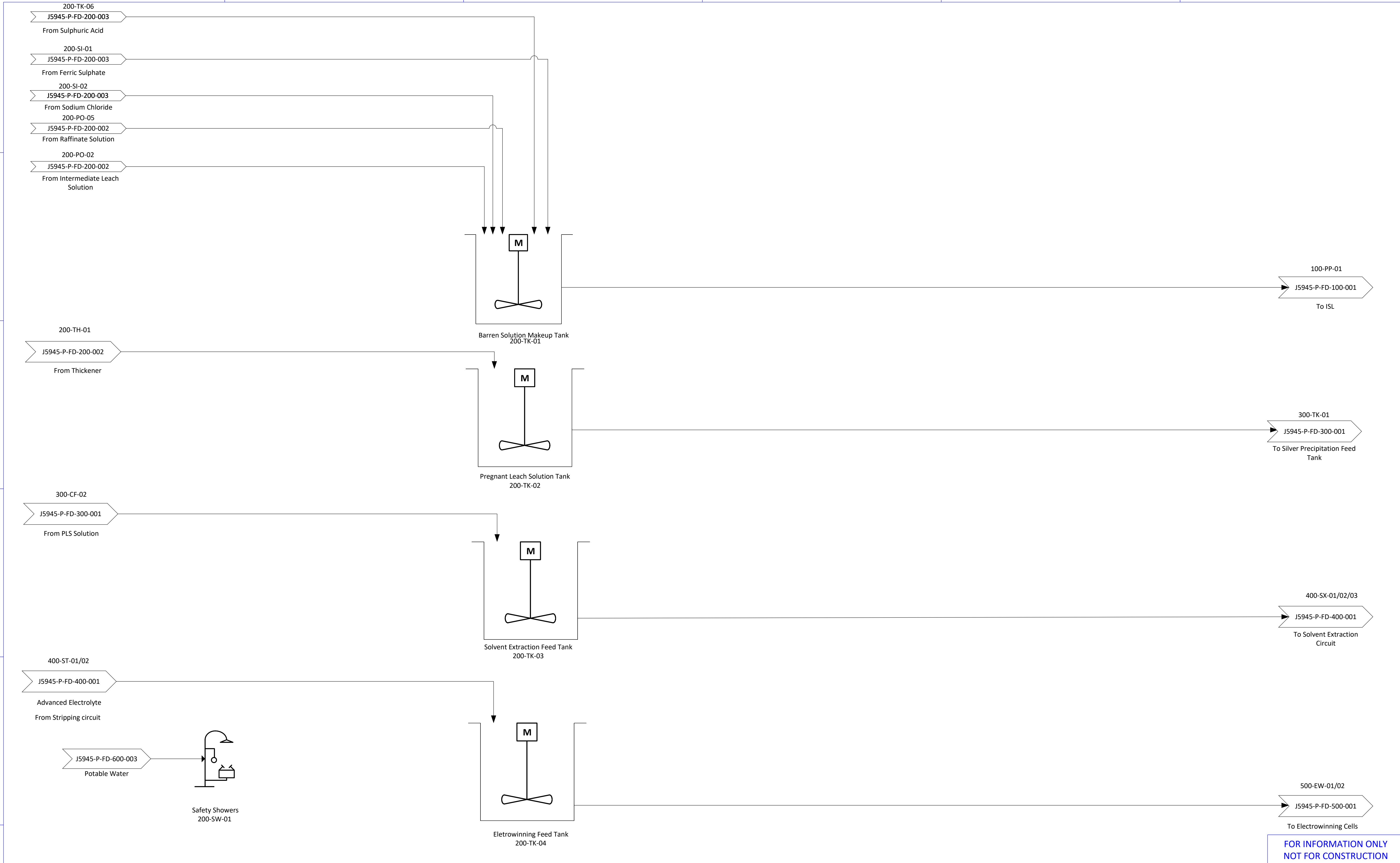

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DRAWN: AR

TITLE: Process Flow Diagram Tank And Pond Farm

AREA: 200
SECTION: Tanks
SHEET: 1 of 3

DRAWING NO. J5945-P-FD-200-001

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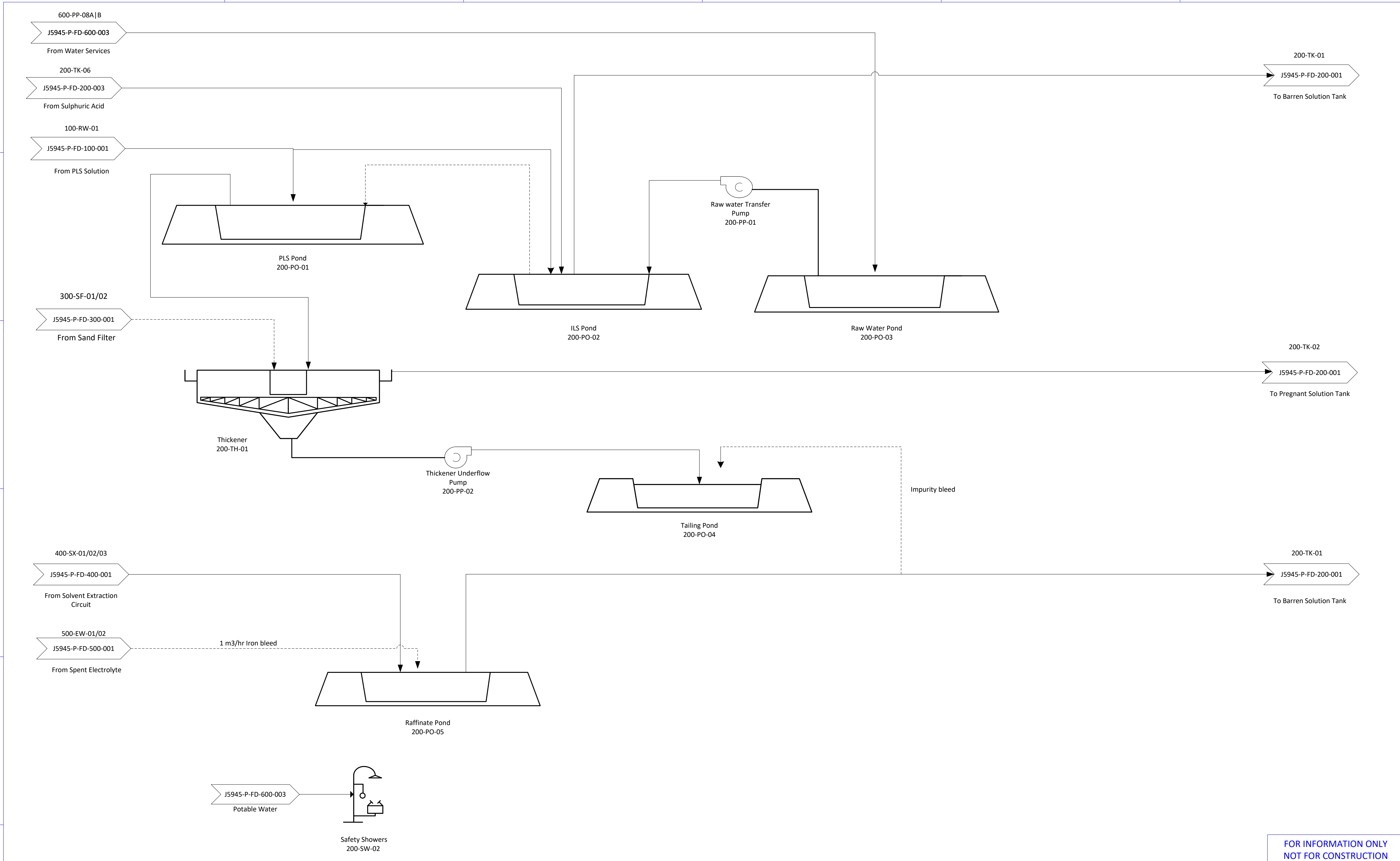

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TITLE: Process Flow Diagram
Tank And Pond Farm

AREA: 200
SECTION: Ponds and Thickener
SHEET: 2 of 3

DRAWING NO. J5945-P-FD-200-002

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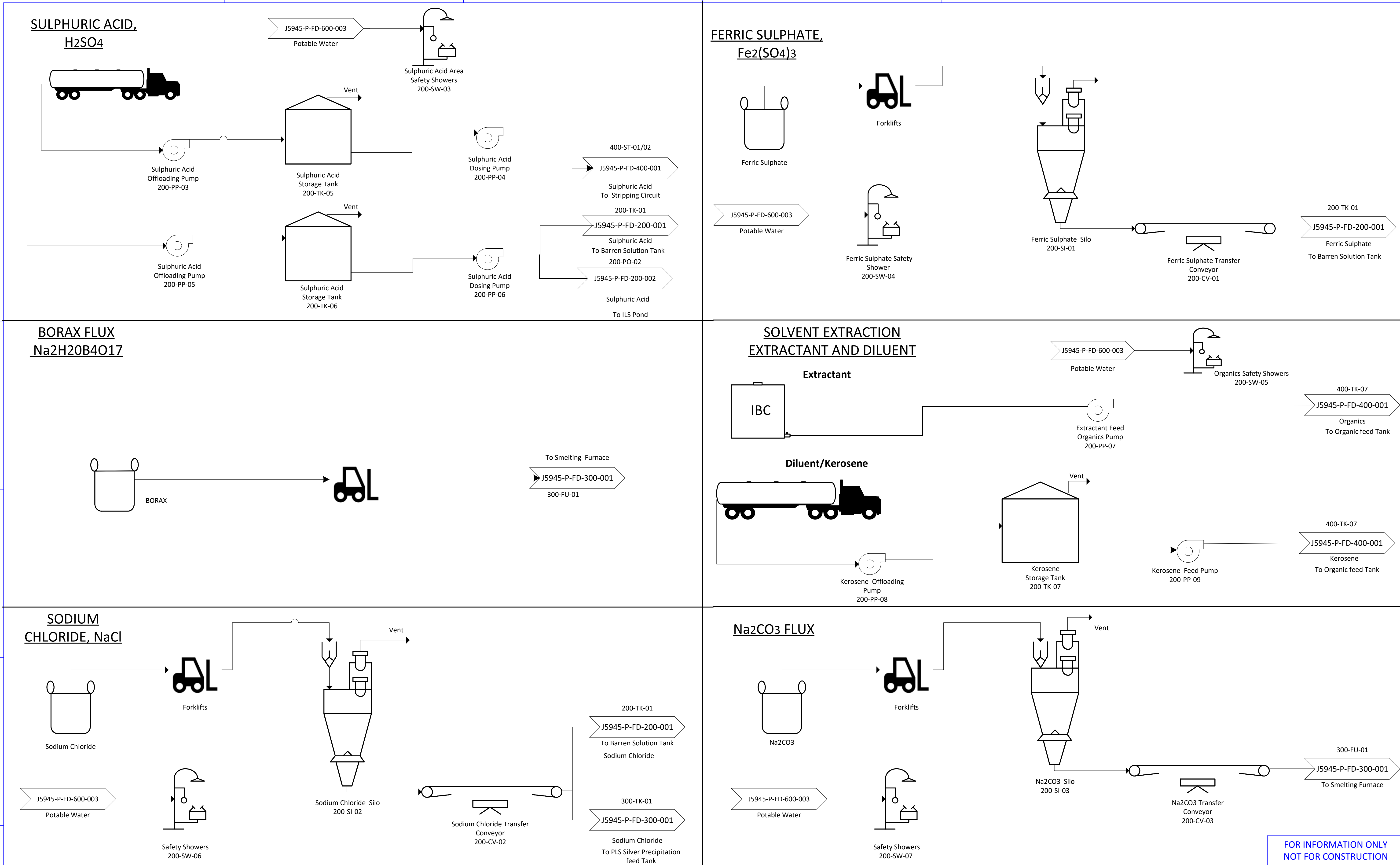

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TITLE: Process Flow Diagram
Tank And Pond Farm

AREA: 200
SECTION: Reagents
SHEET: 3 of 3

DRAWING NO. J5945-P-FD-200-003

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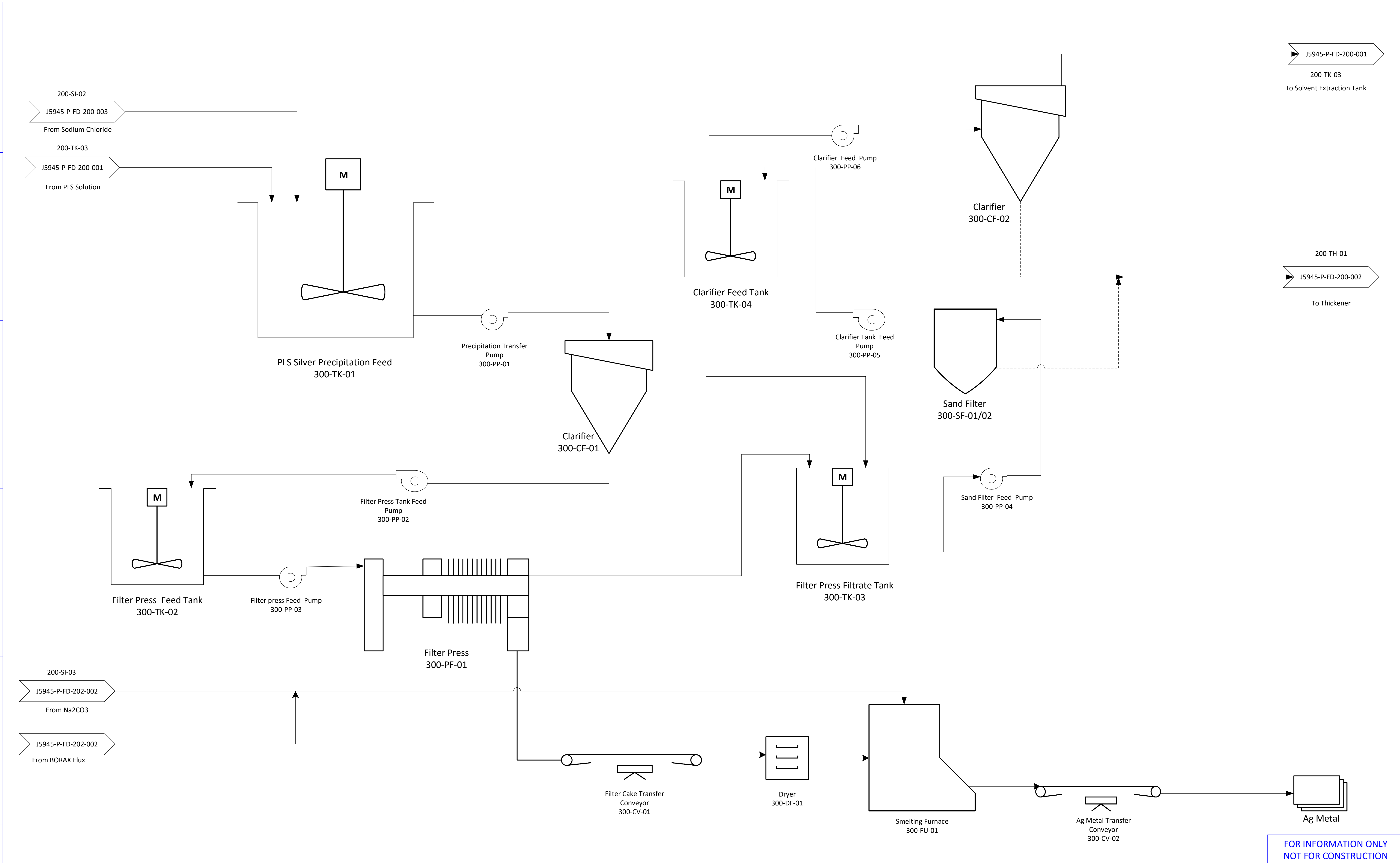

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TITLE: Process Flow Diagram
Silver Precipitation

AREA: 300
SECTION: Silver Precipitation
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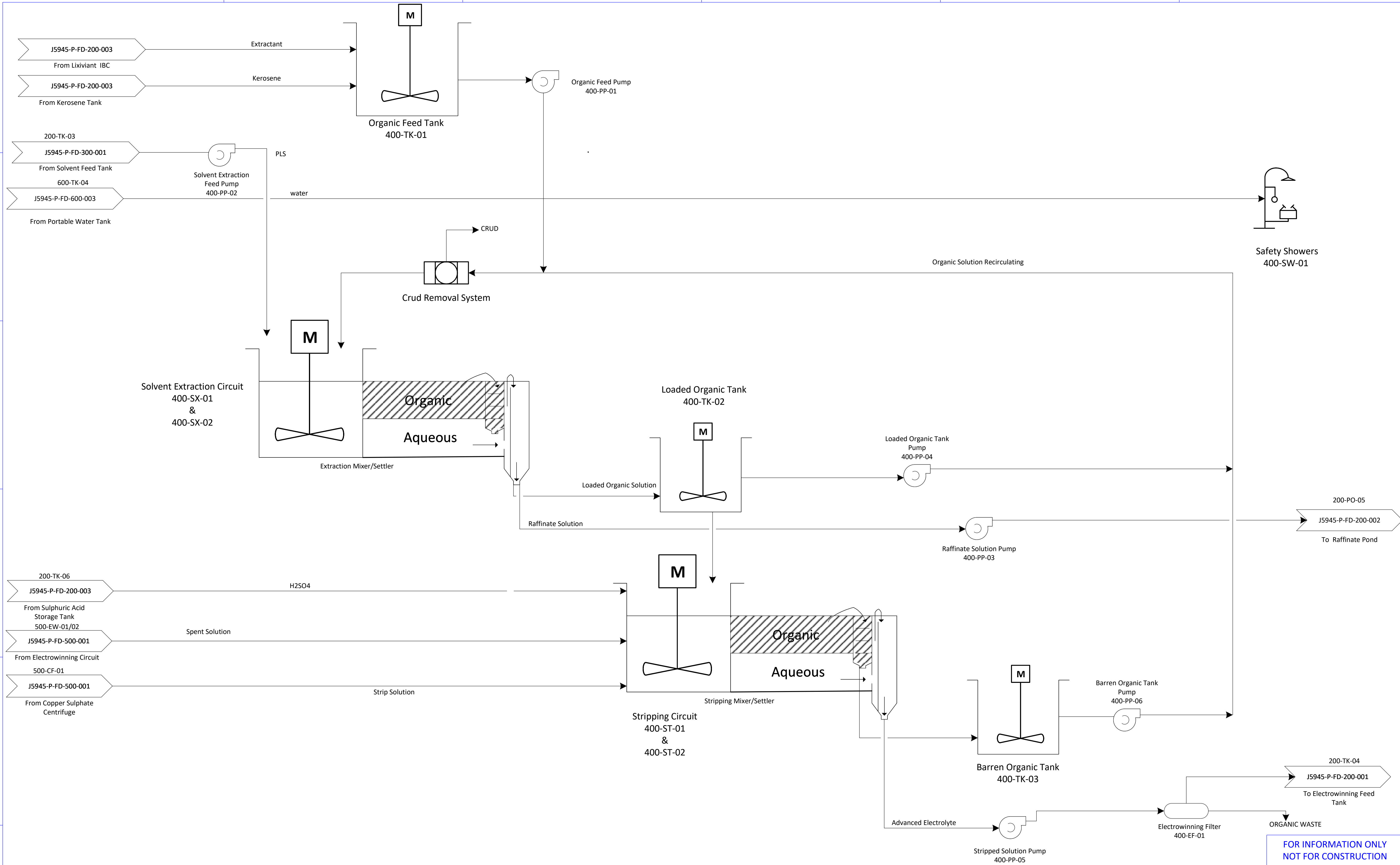

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TITLE: Process Flow Diagram
Solvent Extraction

AREA: Solvent Extraction
SECTION: 400
SHEET: 1 of 1

DRAWING NO. J5945-P-FD-400-001

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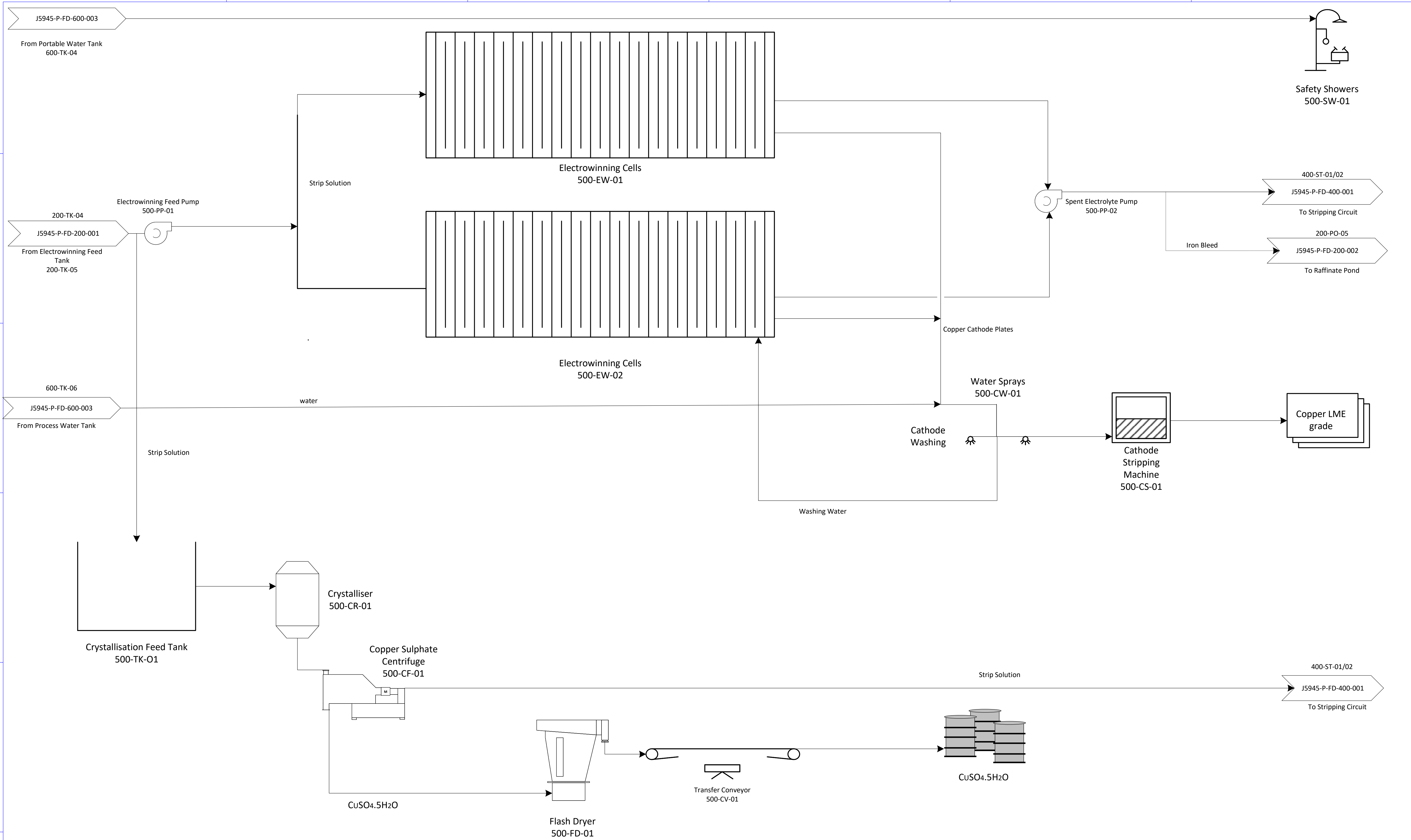

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TITLE: Process Flow Diagram
Electrowinning

AREA: Electrowinning & Copper Sulphate
SECTION: 500
SHEET: 1 of 1

DRAWING NO. J5945-P-FD-500-001

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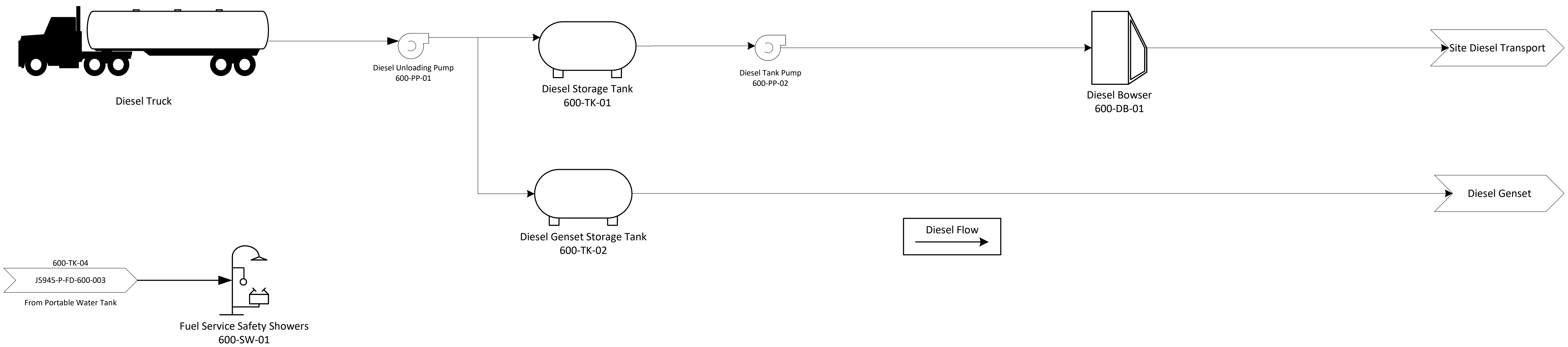
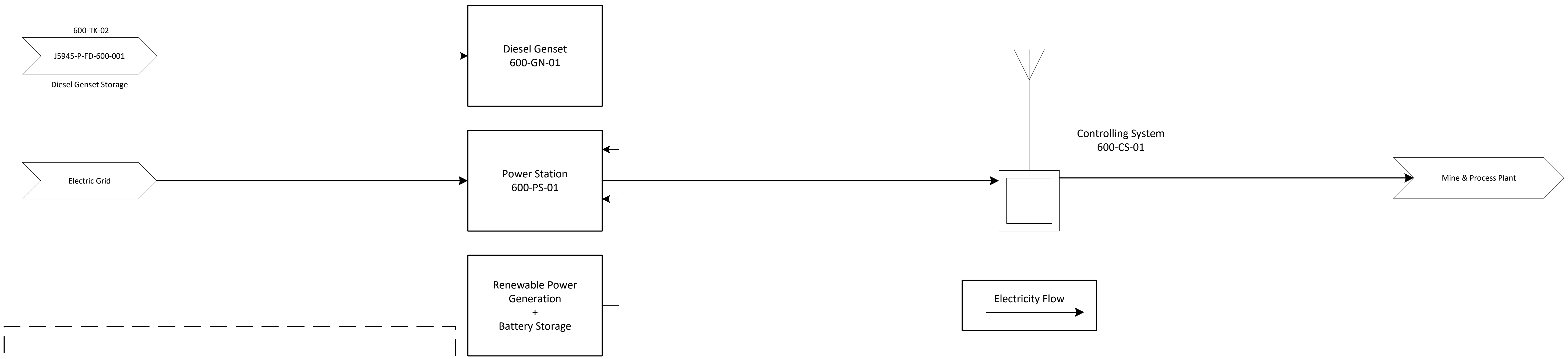


PLANT POWER SERVICES



1.Diesel Genset with capacity to back up plant when electricity grid is down.
2. Renewable power generation : solar or wind or a combination of both with battery storage

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TITLE: Process Flow Diagram
Site Service

AREA: Diesel & Power Services
SECTION: 600
SHEET: 1 of 3

DRAWING NO. J5945-P-FD-600-001

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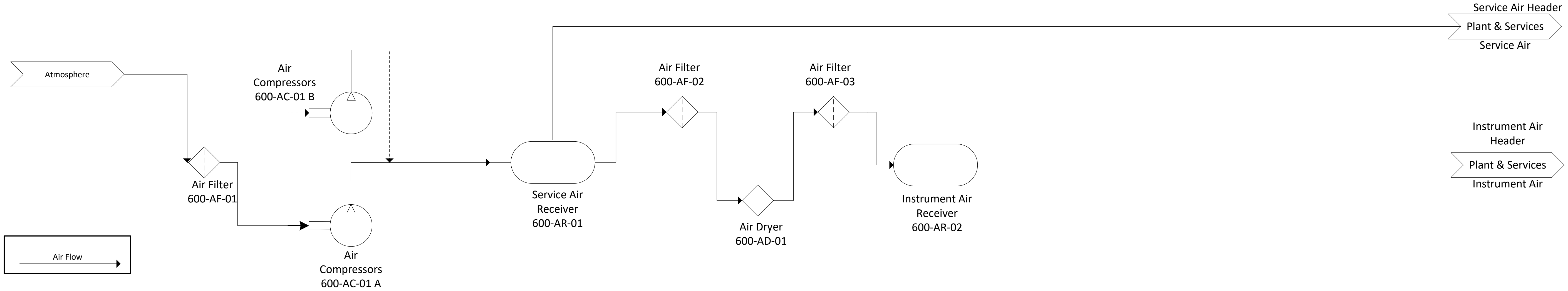
PLANT AIR SERVICES



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A	12/07/24	Issued for Internal Review	HM	MN	DC

REV	DATE	DRAWING NUMBER	REFERENCE DRAWING TITLE

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TITLE: Process Flow Diagram
Air Services

AREA: Air Services
SECTION: 600
SHEET: 2 of 3

DO NOT SCALE

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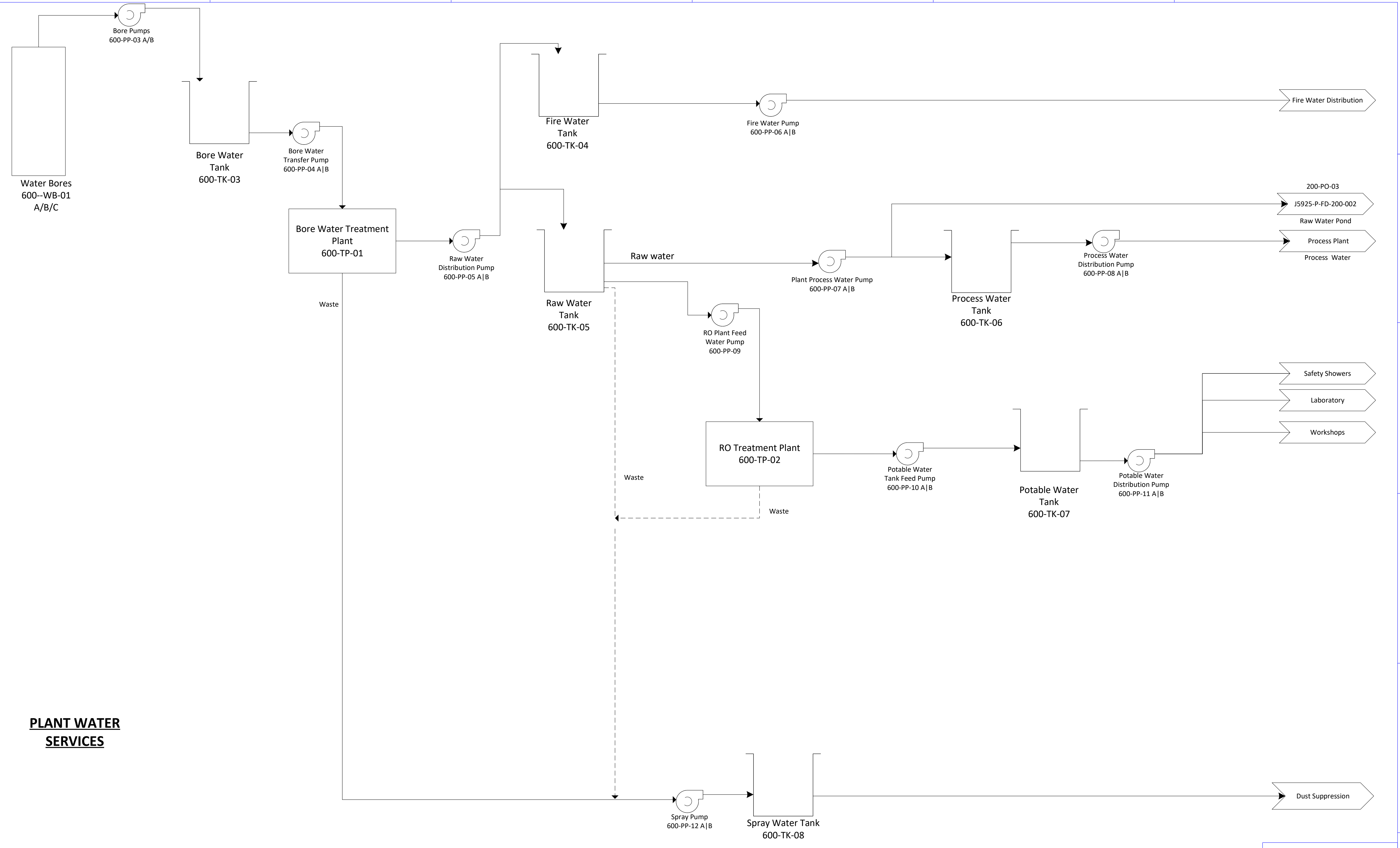

PLANT WATER SERVICES

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VERIFIED | SIGNED | DATE
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TITLE: Process Flow Diagram Water Services

AREA: Water Services
SECTION: 600
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DRAWING NO. J5945-P-FD-600-003

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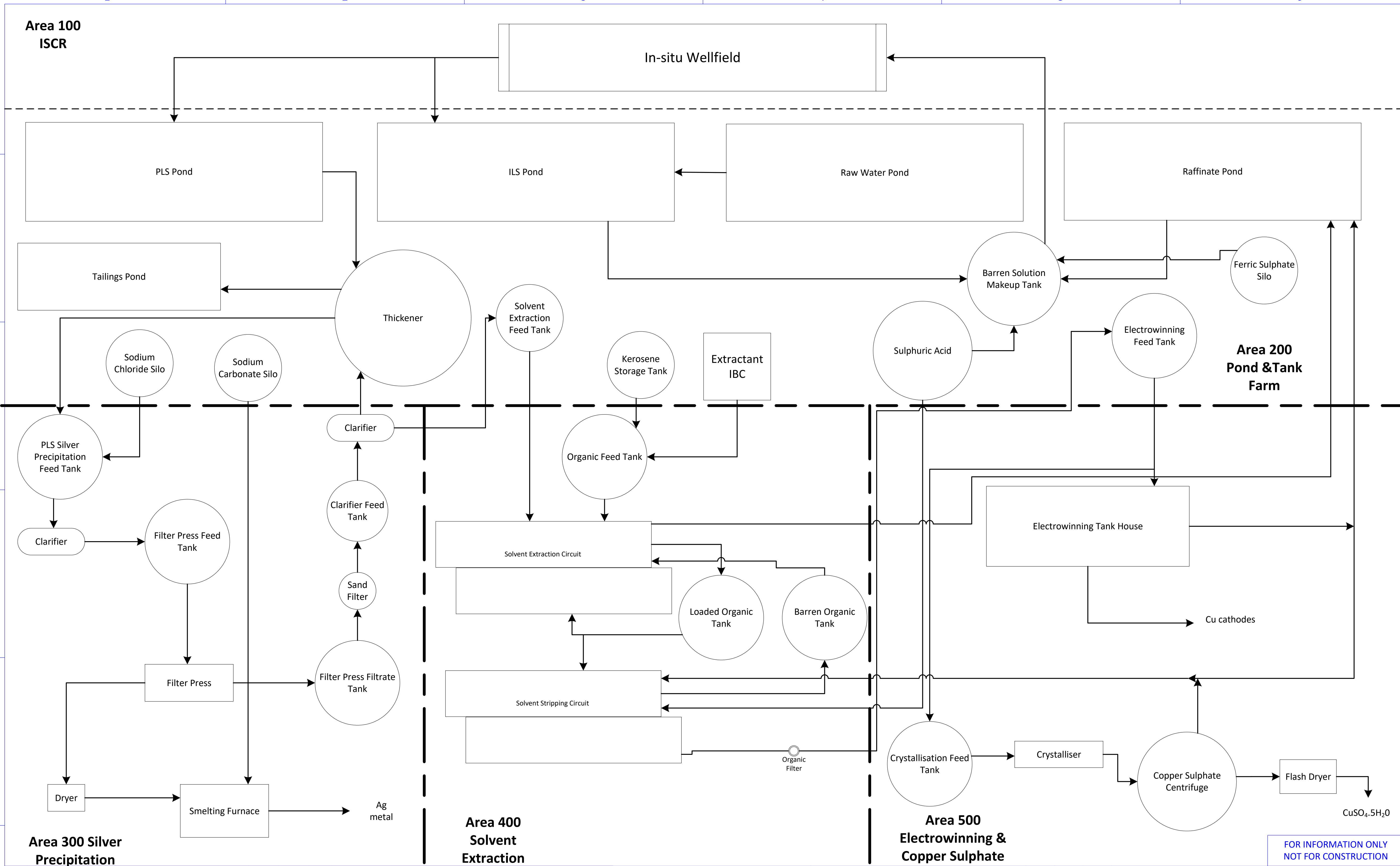

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TITLE: Process Flow Diagram
In Situ Copper Recovery (ISCR)

AREA: Preliminary Process Layout

SECTION:

SHEET: 1 of 1

DRAWING NO. J5945-P-FD-700-001

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APPENDIX B – Process Description

Appendix items

METS ENGINEERING
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Cobre Limited

Ngami Copper Project (NCP)

Process Description In-situ Copper Recovery (ISCR)

CONFIDENTIAL
Project No. J5945
Date: September 2024

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J5945- Ngami Copper Project Process Description – In-Situ Copper Recovery							
REV	**DESCRIPTION**	**ORIG**	**REVIEW**	**APPROVAL**	**DATE**	**CLIENT APPROVAL**	**DATE**
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C	Issued for Internal Review	HM H. Mukundu	DI D. Ibana	DC D. Connelly	23/08/24	n/a	
0	Draft Issued for Client Review	HM H. Mukundu	MN M. Nicholls	DC D. Connelly	09/09/24	AW A. Wooldridge	
1	Issued for Information	HM H. Mukundu	MN M. Nicholls	DC D. Connelly	14/10/24	n/a	

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ABBREVIATIONS

Abbreviation	Definition
EW	Electrowinning
ISCR	In-situ Copper Recovery
IW	Injection Well
LME	London Metal Exchange
MEL	Mechanical Equipment List
PFD	Process Flow Diagram
PLS	Pregnant Leach Solution
ILS	Intermediate Leaching Solution
PO	Pond
PP	Pump
SX	Solvent Extraction
TK	Tank
AgCl	Silver Chloride
Cu	Copper
HCl	Hydrochloric Acid
H_2O	Water
H_2SO_4	Sulphuric Acid
NaCl	Sodium Chloride
O_2	Oxygen
CSTR	Continuous Stirred Tank Reactor

1. INTRODUCTION

The optimal extraction method proposed for the Ngami Copper Project (NCP) in the Kalahari Copper Belt (KCB), Botswana is an in-situ copper recovery (ISCR) operation. ISCR is the preferential extraction method based on the analysis and current understanding of the geology, hydrology, mineralisation of the orebody, metallurgy, mining options, processing options and project costs.

The Process Description Document is to be read in conjunction with the overall Process Flow Diagram (PFD) and Mechanical Equipment List (MEL). These documents provide an overview of the equipment, consumables, utilities, and an overall picture of the process. The overall process can be separated into 6 areas as shown in Table 1-1 below.

Table 1-1: Area Description

Area	Description	Category
100	In-situ Recovery (ISR) Wellfield	Extraction
200	Tank Farm	Storage and Distribution
300	Silver Precipitation	Process Plant
400	Solvent Extraction	Process Plant
500	Electrowinning	Process Plant
600	Site Services	Power, Diesel, Water, & Air

2. PROCESS DESCRIPTION

2.1 Overview

The Cobre Ngami Copper Project will use solvent extraction (SX) and electrowinning to recover LME grade copper metal, crystallisation to recover copper sulphate and precipitation to recover silver from the pregnant liquor solution (PLS) extracted by an in-situ copper recovery (ISCR) wellfield. The project will consist of six main areas and two sub areas namely,

- Area 100: In-situ Copper Recovery (ISCR) Wellfield
- Area 200: Tank Farm and Pond Farm
- Area 300: Silver Precipitation
    - Area 301: Silver Production
- Area 400: Solvent Extraction
- Area 500: Electrowinning
    - Area 501: Copper Sulphate Crystallisation
- Area 600: Site Services

All the areas are connected and produce either inputs or outputs for the next process area. The overview of the distribution is shown in Figure 2-1.

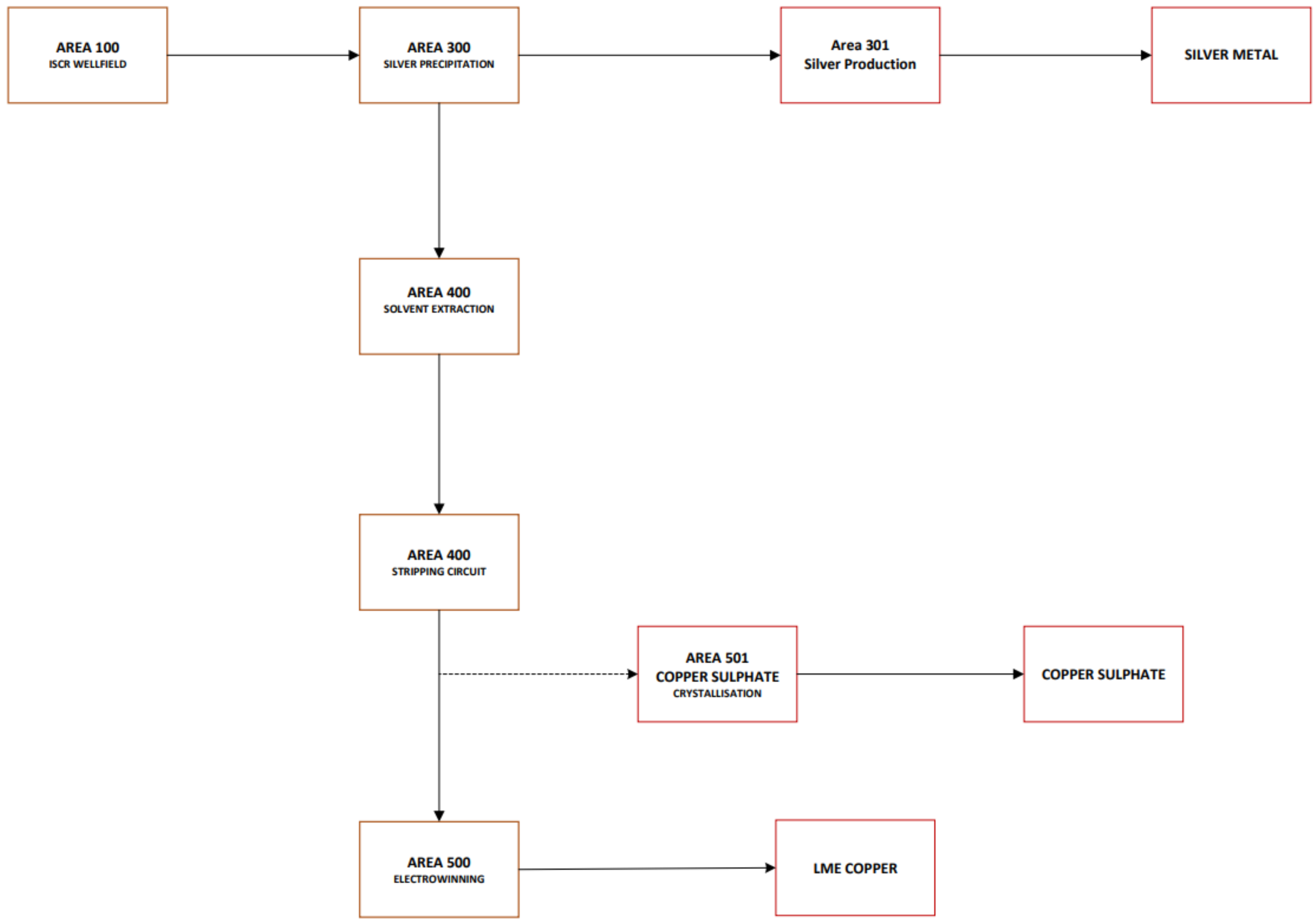

Figure 2-1 Process Overview

2.2 Area 100: In-Situ Copper Recovery (ISCR)

2.2.1 In-situ Recovery (ISR) wellfield

In the right geological conditions, solution mining in the form of in-situ copper recovery (ISCR) allows for the profitable recovery of metals from orebodies where conventional mining methods are constrained by economic, social, or environmental factors.

Injection wells and recovery wells are drilled within the copper mineralised ore deposit according to geological surveys, hydrological studies, and initial metallurgical tests preparing the area for in-situ copper recovery.

Refer to Figure 2-2 for the illustration example of in-situ leaching.

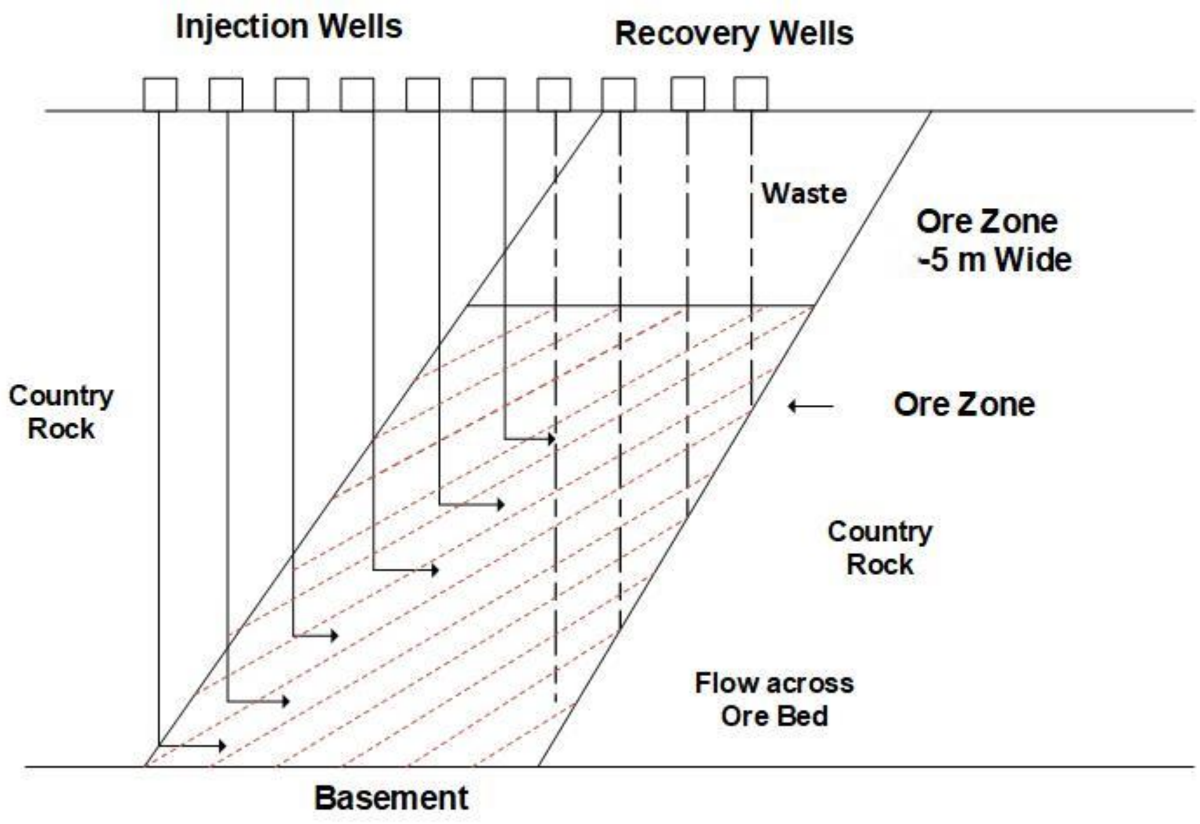

Figure 2-2 : Cross Section of Injection and Recovery Wells in the ISCR Field

There are a few factors affecting the efficiency of in-situ copper recovery. These include the following:

- Permeability (hydraulic conductivity) and porosity (capacity to hold water) of both the host rock, overburden, and base layer.
- Geology and mineralogy features of the ore body and overburden including rock fractures and structures.
- Hydrology (i.e. location of groundwater table, direction of groundwater flows, etc.)
- Type of topsoil material

Hydrological studies including rate of groundwater flow (transmissivity) flow directions, water pumping rates and drawdown will strongly affect the processing considerations around the field and leaching process. An understanding of the geology of the orebody and associated structures and rock fractures will influence the efficiency of an in-situ operation and dictate process parameters.

2.2.2 Potential Wellfield Arrays

In ISCR wellfields, several configuration options can optimise the extraction process based on geological, hydrological and operational factors.

The line drive pattern, as shown in Figure 2-3, involves arranging wells in parallel lines with alternating rows of injection and recovery wells. This configuration effectively enhances leaching efficiency and metal recovery by ensuring uniform distribution of the leaching solution across the orebody. The line drive pattern is particularly suited to the project, given the structurally controlled high-grade intersections observed so far, optimising the recovery of both copper and silver. This scalable design ensures uniform distribution of the leaching solution and maximises contact with the orebody, enhancing overall recovery rates.

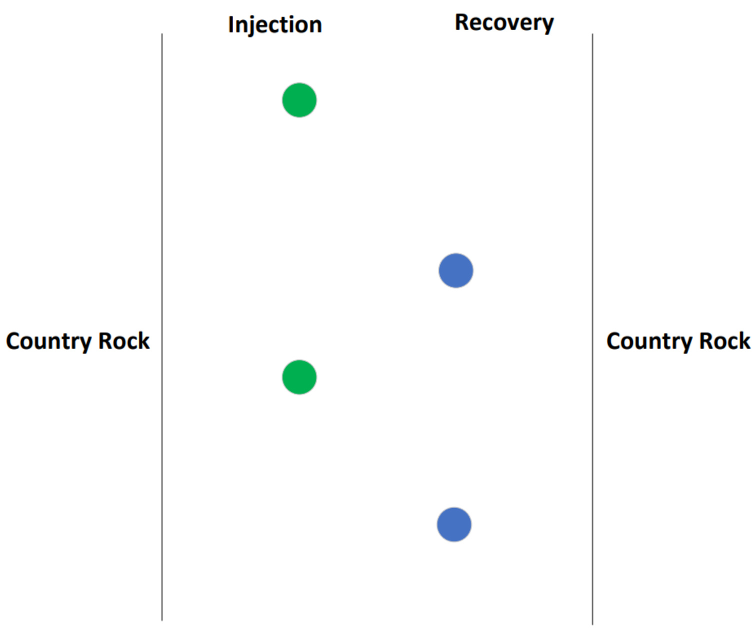

Figure 2-3 : ISR Wellfields configuration

As shown in Figure 2-4 the mineralisation zone is narrow ~ 5 m wide. To effectively access the mineralisation and to access this narrow ore body a line drive pattern will be utilised in the wellfield design.

Injection testing performed in May 2024 by WSP evaluated a range of injection rates for 24 hours. By monitoring the groundwater level in monitoring wells at different distances from the injection wells a constant injection rate of 3 L/s for 24 hours was observed. This is positive for the implementation of ISCR in this ore body. Since the May results, more tests have shown that injection rates up to 7L/s can be achieved.

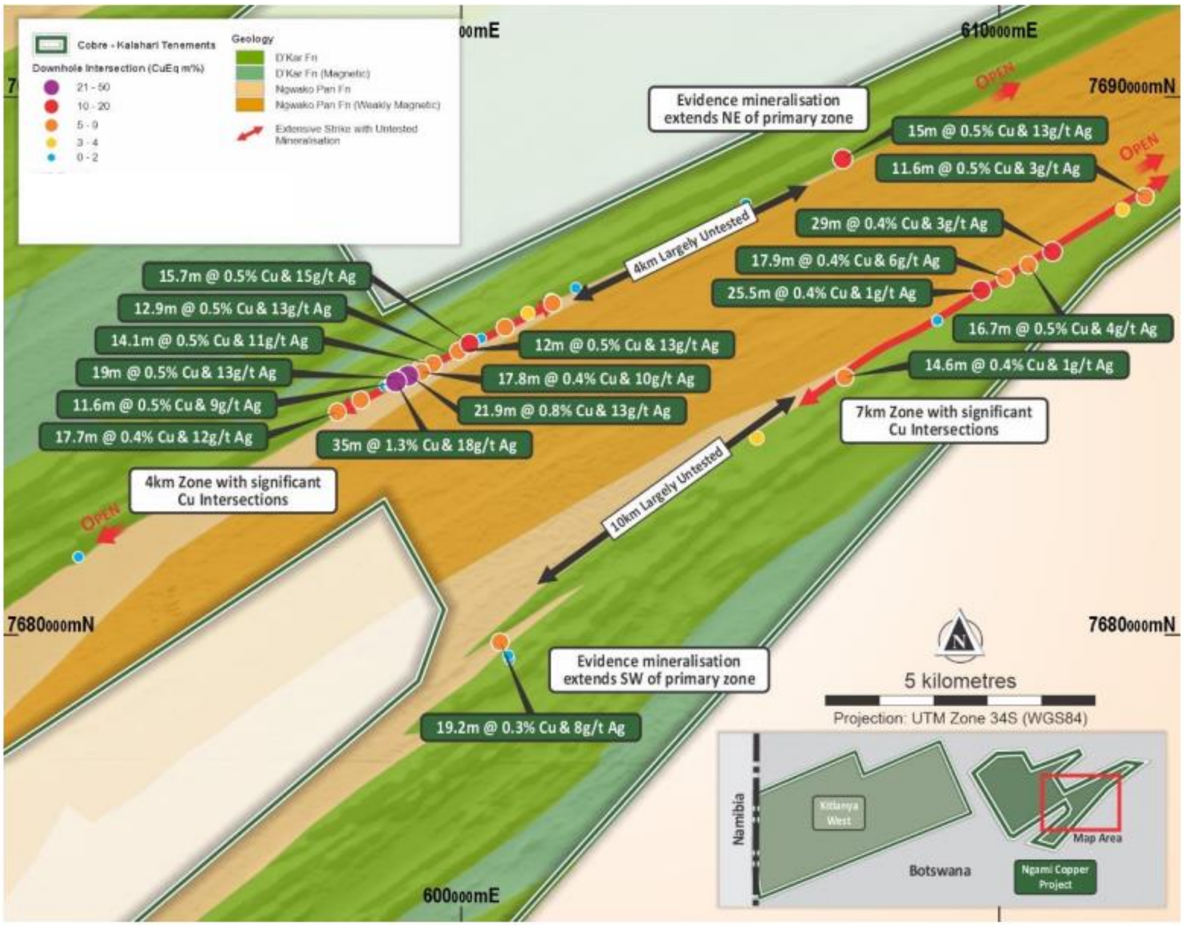

Figure 2-4 : Locality map illustrating the position of the test study

2.2.3 Operation of the Field

The leaching solution is injected directly into the ore deposit via injection wells (100-IW-01) during the injection cycle. A surface-mounted positive displacement pump (100-PP-01) will pump the leaching solution down the injection wells.

Submersible pumps are used to transfer the Pregnant Leach Solution (PLS) from the recovery wells. The Recovery Well Lift Pump (100-PP-02) will lift the PLS up the Recovery Well (100-RW-01) and discharge to the PLS Pond (200-PO-01). The PLS pond will provide a larger buffer volume for managing PLS solution. The PLS solution will be pumped to the Pregnant Leach Solution Tank (200-TK-02) for storage ahead of further downstream processing via the Thickener (200-TH-01).

2.2.4 Rinsing of the Field

The rinsing process after copper extraction involves three stages:

Early Rinse: This stage involves flushing and diluting the remaining pregnant leach solution (PLS) within the formation. Injection of the leaching solution continues until the copper concentration in the recovered solution drops below 0.1 g/l.

Rest Period: After the early rinse, the wellfield is closed to allow for a rest period. During this time, the formation's natural neutralisation capacity counteracts the acidity in the diluted solution.

Late Rinse: The final stage involves flushing out the neutralised solution until all regulated constituents meet specified concentrations. If necessary, a second cycle of injection will be conducted to further dilute and rinse any remaining solution, followed by another rest period if required.

Once the closure criteria for the wellfield are met, the injection and recovery wells are decommissioned and may need to undergo grout injection to the water table or as prescribed by permitting conditions. This systematic process ensures comprehensive recovery of process solutions, restoration of water quality, and facilitates the decommissioning of the wellfield. Commonly referred to as well remediation. ISCR operations will also be subjected to relevant above ground decommissioning as per permit conditions.

2.2.5 Copper Extraction

In-situ copper recovery involves the preparation of the leaching solution in the Barren Solution Makeup Tank (200-TK-01). The primary reagent is sulphuric acid. It serves to dissolve the copper bearing minerals from the ore deposit. The solution is injected directly into the ore deposit via injection wells (100-IW-01) using Injection Well Pump (100-PP-01), a positive displacement pump located on the surface.

As the leaching solution permeates the ore, it contacts the copper-bearing minerals resulting in their dissolution. Some copper minerals, such as chrysocolla ($CuSiO_3.2H_2O$) for example, are easily dissolved in dilute sulfuric acid as the reaction involves only acid attack and no redox reaction and thus, no oxidant is needed (Equation 1).

Equation 1

$$CuSiO_3.3H_2O(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + SiO_2.H_2O(s) + 3H_2O(l)$$

Other copper minerals require an oxidant to render their component elements soluble. An example is chalcocite (Cu_2S). In this case, although the cuprous form (Cu^+) of copper is soluble, the sulphide ion (S^{2-}) is not and needs to be oxidised to its +6 oxidation state (SO_4^{2}), which is the soluble form. This can be achieved by adding an oxidant, such as ferric ion, oxygen or iron/sulphur oxidising bacteria. In a highly oxidising environment enough to oxidise sulphide to sulphate, the cuprous ion (Cu^{+}) is also oxidised to its cupric form (Cu^{2+}). Equation 2 shows the overall reaction for the leaching of chalcocite.

Equation 2

$$\mathrm{Cu_2S + O_2 + 2H_2SO_4 \rightarrow 2CuSO_4 + 2H_2O}$$

Oxygen is soluble in water and thus, naturally exists in aqueous solutions up to its maximum solubility. The dissolved oxygen can also be enriched by aeration.

If Fe (III) is the only oxidant, the chalcocite leaching involves two sequential redox reactions Equation 3 and Equation 4.

Equation 3

$$\mathrm{Cu_2}S + Fe_2\mathrm{(SO_4)_3} \rightarrow \mathrm{CuS}O_4 + 2FeSO_4 + \mathrm{CuS}$$

Equation 4

$$\mathrm{CuS} + Fe_2\mathrm{(SO_4)_3} \rightarrow \mathrm{CuS}O_4 + 2\,FeSO_4 + S$$

Equation 5 is the overall leach equation:

Equation 5

$$\mathrm{Cu_2}S + 2Fe_2\mathrm{(SO_4)_3} \rightarrow \mathrm{2CuSO_4} + \mathrm{4FeS}O_4 + S$$

The presence of suitable bacteria markedly increases chalcocite oxidation breaking down the CuS formed:

Equation 6

$$CuS + 2O_2 \rightarrow CuSO_4$$

Once the copper is dissolved into the solution, the pregnant leach solution (PLS) containing dissolved copper migrates towards strategically placed recovery wells. Submersible pumps and the surface pumping system are used to transfer the PLS from the recovery wells to storage tanks for further processing. This injection and extraction process is repeated as necessary across the orebody to ensure saturation and wetting of the orebody with solution to maximise copper recovery.

From the Pregnant Leach Solution Pond (200-PO-01), the PLS is pumped to a Thickener (200-TH-01) to remove solids from the PLS prior to downstream processing via silver precipitation and solvent extraction. The underflow from the thickener is pumped to Tailings Pond (200-PO-06) whilst the overflow PLS is pumped to the Pregnant Leach Solution Tank (200-TK-02).

The pregnant solution is then pumped to the next processing stage which is Silver Precipitation.

2.2.5.1 Silver Extraction

During copper extraction, initial leachability testwork suggested silver may also be recovered from the orebody by the addition of sulphuric acid, ferric sulphate in the presence of chloride ions. It is known in literature that the addition of chloride ions can improve copper recovery. Therefore, there may be an opportunity to extract silver if the right conditions are established and maintained in the wellfield. Consequently, the pregnant leach solution (PLS) recovered could contain the priority target copper ions and silver as a byproduct which would be beneficial to the project.

The method for the extraction of the silver from the ore is still to be determined and will be confirmed with additional testwork and further understanding of the mineralogy of the silver minerals and their association with the copper.

Once the copper and silver have been leached into the pregnant leach solution (PLS), the subsequent processing step involves the separation and recovery of both metals. In the case of silver, selective precipitation is employed to recover it from the solution.

2.2.5.2 Solar heating

Solar heating can enhance leaching efficiency by using black poly pipe to increase the temperature of the leach liquor. Black poly pipe, known for its high sunlight absorption, can be laid out in sunny areas to heat the fluid flowing through it. This heated leach liquor, once injected into the ore deposit, may improve the dissolution rates of copper minerals due to the higher temperatures. Natural thermal mass of underground orebodies can also aid leaching kinetics.

2.3 Area 300: Silver Precipitation

2.3.1 Silver Precipitation

The Pregnant Leach Solution (PLS) is collected from the recovery wells and transferred to the Pregnant Leach Solution Tank (200-TK-03) via the PLS pond. During this step, the PLS is mixed with select reagents typically, sodium chloride (NaCl), that induces the precipitation of silver ions from the solution. The chloride ions (Cl^-) from the sodium chloride (NaCl) react with silver ions (Ag^+) present in the PLS, forming a precipitate of silver chloride (AgCl) according to Equation 7.

Equation 7

$$Ag^{+}{}_{(aq)} + Cl^{-}{}_{(aq)} \rightarrow AgCl_{(s)}$$

The NaCl from the NaCl Silo (200-SI-02) flows into the PLS Silver Precipitation Feed Tank (300-TK-01) containing the PLS solution. To ensure effective precipitation, a high agitation rate is necessary in the continuous stirred tank reactors (CSTR). The aim is to ensure uniform distribution of the reagents throughout the PLS solution enabling a high yield of solid product to form rapidly once a slight excess of chloride ions are added. Excess chloride ions are warranted to ensure as much of the silver is precipitated as possible with the extent of the reaction closely monitored by oxidation reduction potential (ORP) process control meters allowing the adjustment of Cl^- ions by controlling the flow of NaCl. Less than 1 ppm of silver would be left in solution if the reaction is carefully controlled.

The difficulties in the handling silver chloride are the tendency for the solid to pack together and form “prills”. This phenomenon increases with high percent slurries and longer residence times with low mixing speeds with their development aided by “seeding” of other solids or the presence of smaller “prills”. These can be quite large (>3cm) and provide resistance to mixing and pumping. The consequence on plant design is the need for bottom draining tanks and for larger overflow outlets. The inclusion of diaphragm pumps timed to occasionally pump build-up of solids to prevent seeding because of “prills” is also beneficial to the circuit. The presence of copper ions in solution may also result in the loss of some chloride ions by the formation of copper chloride complexes in the supernatant.

Once the precipitation reaction is complete a Precipitation Transfer Pump (300-PP-01) is used to transfer the mixture for settling to separate the solid silver chloride precipitate from the solution. Settling is done using a clarifier (300-CF-01) which is a tank generally built for continuous removal of solids or suspended solids being deposited by sedimentation. The supernatant solution, now depleted of silver ions, is separated from the precipitate as the overflow and passes through a Sand Filter (300-SF-01) before proceeding to downstream processing to extract copper.

2.3.2 Silver Recovery

The collected precipitate AgCl in slurry form, undergoes filtration to further recover silver chloride from the PLS solution. Adequate agitation and mixing of the clarifier feed prior to the introduction to the clarifier will promote rapid clarifying.

The clarifier underflow is pumped into Filter Press Feed Tank (300-TK-02). From this tank (300-TK-02), Filter press Feed Pump (300-PP-03) feeds the Filter Press (300-PF-01). The filter press used is a plate and frame filter. It consists of a series of filter plates and frames arranged alternately, with a filter cloth in between. The silver chloride slurry mixture is pumped into the spaces between the plates. The filtrate, entrained leach solution, passes through the filter cloth and is collected in a tank (300-TK-03), while the recovered silver chloride precipitate is trapped in the spaces between the plates. Once the filtration process is complete, the press opens, and the filter cake, which is the accumulated AgCl precipitate is transferred by a conveyor system into a Dryer (300-DF-01). The filter cloth is then cleaned by a series of water sprays and made ready for another filtration cycle. The system is automated and operates in batch system with the tank (300-TK-02) filling up during a filtration cycle in preparation of the next one. Figure 2-5 shows an illustration of the plate and frame filter operation.

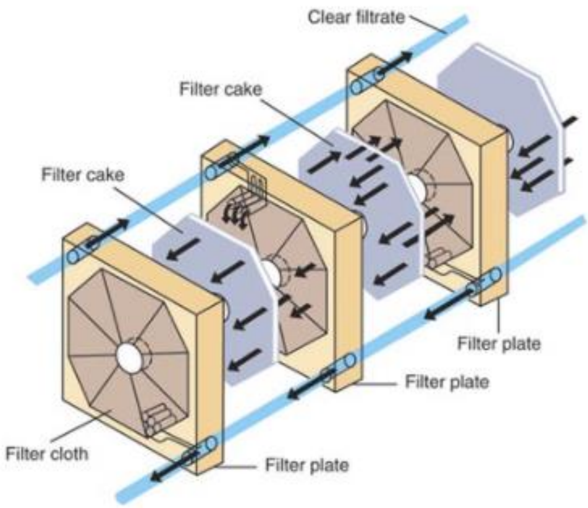

Figure 2-5: Plate and frame filter (scribd.com)

The solution collected in 300-TK-03 is pumped through a Sand Filter (300-SF-01) to remove any particulates remaining. The backwash from the sand filters is pumped to the Thickener (200-TH-01). The filtrate is pumped into a second Clarifier (300-CF-02) via the Clarifier Feed Tank (300-TK-04) to ensure no solid particulates are present in the solution feeding solvent extraction (Area 400). The underflow from the Clarifier (300-CF-02) is recycled to Thickener (200-TH-01).

2.3.3 Silver Production

The silver chloride filter cakes from the Filter Press (300-PF-01) are transferred using a conveyor belt system, Filter Cake Transfer Conveyor (300-CV-01) into a Dryer (300-DF-01) and then into the Smelting Furnace (300-FU-01). The smelting furnace is an electric furnace where sodium carbonate is added for the silver chloride decomposition reactions. Borax flux is added to remove impurities. Borax melts and forms a glassy layer over the molten metal, protecting it from oxidation. Metal oxides are highly soluble in molten glass, so the molten borax removes any oxides that are already there. Smelting is done at ≥ 900°C to make silver metal. Equation 8 and Equation 9 show the decomposition reactions:

Equation 8

$$2AgCl_{(s)} + Na_2CO_{3(s)} \rightarrow Ag_2O_{(s)} + 2NaCl_{(s)} + CO_{2(g)}$$

Equation 9

$$2Ag_2O_{(s)} + Heat \rightarrow 4Ag_{(s)} + O_{2(g)}$$

The final Ag metal is weighed and transferred using a conveyor belt system to storage.

2.4 AREA 400: Solvent Extraction

Solvent extraction (Area 400) is used as a concentration and purification process for the copper extracted during in-situ leaching before electrowinning. The contaminated low copper tenor solutions produced in the leaching process are not suitable feed for electrowinning to produce copper metal.

The solvent extraction process will involve two steps: extraction to transfer the dissolved copper from the pregnant leach solution (aqueous phase) into an organic phase and stripping to transfer the high purity copper from the organic phase back to an aqueous phase, which is essentially reversing extraction step. The latter is usually done using the barren electrolyte from the electrowinning circuit. The loaded electrolyte is fed back to the electrowinning circuit.

The organic phase consists of a synthetic organic molecule (the extractant like ACORGA M5774), oxime, which in this case will be designed to be highly selective to copper over other metal ions in the PLS ensuring optimal copper transfer of the target metal. The oxime is dissolved in a diluent (kerosene), which acts as a carrier medium for the extractant in the Organic Feed Tank (400-TK-01). Sometimes, a modifier is required too. Whether this would require one is experimentally determined for each application.

The solvent extraction circuit consists of two extraction cells and two stripping cells. The PLS and organic solvent are pumped into a mixer-settler unit (400-SX-01) in a counterflow configuration. The two are mixed in the mixer compartment for a short period to optimise the transfer of the copper ions from the feed (aqueous phase) to the organic phase (solvent). The mixing decreases the droplet sizes and thus increases the surface area of contact between the aqueous and organic phases and consequently, increases the rate of the metal ions transfer. The extraction of copper from dilute sulphuric acid (PLS) is pH dependent, and thus, an appropriate pH monitoring and adjustment is required. For oximes, copper extraction is optimised when operated at a pH of about 2 but the nature and concentration of the anions in the solution could change the optimum pH. So, the actual operating pH needs to be determined beforehand.

Subsequently, from the mixer unit, the mixed solutions flow directly into the settler compartment where the organic and aqueous phases are allowed to separate due to differences in density between the phases. Since the organic density (~0.81 kg/L) is less than the density of the PLS (~1.1 kg/L), the organic will always float on top of the aqueous. The phases are then separated and the resulting copper depleted aqueous solution, raffinate, is pumped to the raffinate pond (200-PO-05). The copper loaded organic phase is sent for stripping (400-ST-01/02) whilst some is recycled back into the extraction cells to further enrich the organic phase (400-SX-01/02).

The loaded solvent from the extraction stage is then contacted with the barren electrolyte pumped from the Electrowinning Circuit (500-EW-01/02) and sulphuric acid from the Sulphuric Acid Storage Tank (200-TK-06) as required in the Stripping Circuit. The stripping stage also consists of mixer/settler units (400-ST-01/02) with the two solutions pumped into the units are in a counterflow configuration.

The loaded solvent is mixed with a stripping solution consisting of sulfuric acid of suitable concentration in the stripping cell before disengaging the phases in the settler. During the stripping stage, sulfuric acid is added to maintain an acidic environment that facilitates the transfer of copper ions from the loaded organic solvent back into the aqueous phase, allowing for efficient separation and recovery of purified copper sulphate solutions of typical concentration of 40-60g/l. The barren organic solution is then recirculated back to the extraction stage to collect more copper.

Meanwhile, the enriched or advanced electrolyte solution is directed through an Electrolyte Feed Tank (200-TK-04) to the electrowinning process after the solution passes through a Filter (400-EF-01) to remove any impurities including entrained organic or possible solids from crud build-up in the circuit prior to electrowinning. The quality of the copper metal produced, and the efficiency of electrowinning is affected by such contaminants.

The extraction and stripping processes are undertaken as a continuous steady state system, with PLS being fed into the extraction process at one end and a concentrated copper solution emerging at the other end ready for electrowinning.

2.4.1 Extraction

In the extraction stage the PLS solution is mixed with organic solution containing the extractant. The extractant releases its protons and coordinates with copper, transferring the copper from an aqueous phase to organic phase. The released protons increase the acid level of the aqueous phase and thus the need for pH adjustment.

Equation 10

$$Cu^{2+}(aq) + 2RH(org) \rightarrow R_2Cu(org) + 2H^+(aq)$$

Where:

$Cu^{2+}(aq)$ - is copper in solution (PLS)

$RH(org)$ - is the extractant i.e stripped organic

$R_2Cu(org)$ - is the copper/extractant i.e. loaded organic

$2H^+(aq)$ - is acid in raffinate solution

2.4.2 Stripping

Equation 11

$$R_2Cu(org) + 2H^+(aq) \rightarrow Cu^{++}(aq) + 2RH(org)$$

Stripping is accomplished by contacting the copper containing (loaded) organic phase with the barren electrolyte, which has higher pH than the feed in the extraction stage. In most cases, an excess acid concentration of approximately 50 g/L H_2SO_4 is required to maintain adequate stripping.

If electrowinning is used to recover the copper, spent electrolyte from the electrowinning circuit is used as the stripping agent, and the copper content can be increased to any desired level up to about 100 g/L Cu for use as a strong electrolyte. The now stripped organic solvent can then be recirculated back to the extraction circuit to the start of the process to extract more copper.

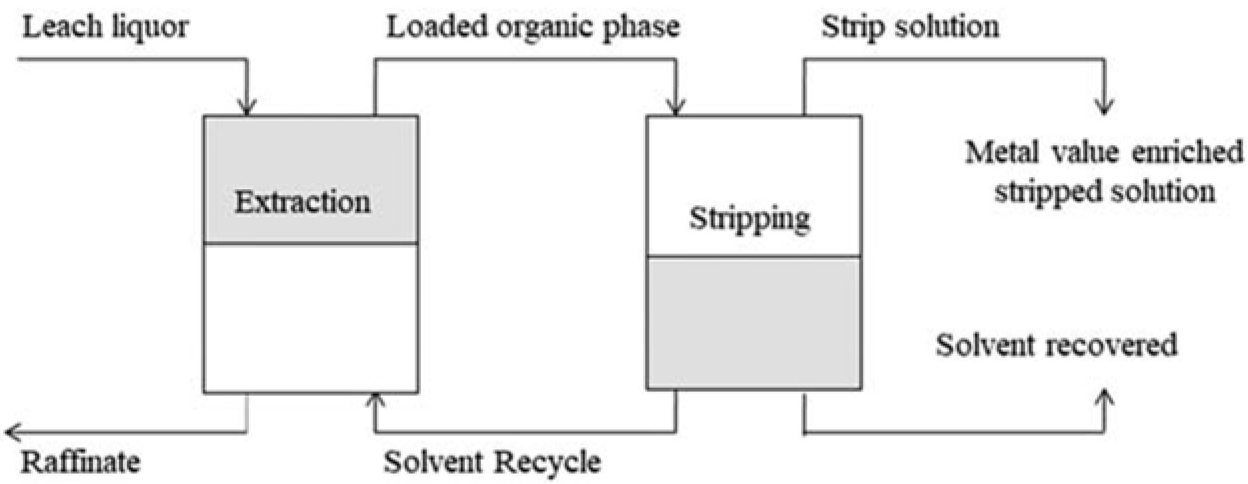

Figure 2-6 Typical SX-ST Illustration (ebrary.net)

2.4.3 Crud Formation and Removal

All solvent extraction plants form crud which is mainly caused by solids from the feed. Crud consists of organic, aqueous, air and a solid matter, which can be found randomly throughout the organic layer and sometimes on the top of the layer as floating crud or "fish eyes" but often collect at the interphase of the organic and aqueous phases. It can promote emulsion stability, phase continuity, aqueous solution and air distribution causing loss of organic and lower metal extraction efficiency. A Crud Removal System is necessary and has been included in the process to optimise organic recovery and quality and thus, the extraction efficiency.

The crud will be removed from the system as waste, but the recyclable organic material is reconditioned and returned to the organic inventory. There are a variety of options for crud removal and treatment that are commercially available. The removal of crud is often done by suctioning it from the interface and the separation of the organic from the solids is done by specialised centrifuging using a 3-phase centrifuge system. The organic and aqueous components of the crud are separated, and the recovered organic is reconditioned and fed back into the process. The aqueous and solids components are disposed of appropriately.

The use of cyclones has been tried with different degrees of success. Other crud treatment processes have included the use of bentonite, whereby its hydrophilic property, expansibility, adherence, thixotropy and absorption property impels the crud demulsification resulting in the precipitation of the solids with the bentonite and allowing reclamation of the organic. The use of steam to raise the temperature of the crud to 45 °C to facilitate demulsification has also been considered. This latter technique needs to consider the impact of excessive temperature on the hydrolytic degradation of the extractant.

Crud formation is largely influenced by the nature of the feed. As no two feeds have identical nature, the crud mitigating strategy that would work for a particular SX application needs to explore once crud has formed. Occasionally, the crud that forms is minimal that it is even beneficial to the process and needing only occasional removal by scraping to maintain the designed efficiency of the process. Achieving a clean feed PLS is one way of minimising crud formation.

2.5 AREA 500: ELECTROWINNING

Electrowinning is a widely used method for extracting copper metal from solution. In this process, the loaded strip solution is pumped from the Electrowinning Feed Tank (200-TK-04) to the Electrowinning Cells (500-EW-01,02). These are electrolytic cells equipped with alternating cathodes and anodes immersed in the advanced copper electrolyte solution. The cathodes are typically made of stainless steel whilst the anodes in acidified sulphate solutions are lead-based.

As electric current is applied to the electrowinning cell, the copper ions in the electrolyte solution are attracted to the cathode surface, where they are reduced to the metallic form and deposited. This electrodeposition process effectively removes a portion of the copper from the solution, resulting in the production of high-purity copper metal (LME grade) at the cathode. Simultaneously, the anodes in the electrowinning cell undergo oxidation, releasing electrons. This process helps maintain electrical neutrality within the cell and enables the continuous deposition of copper metal at the cathode. The cathodes loaded with metallic copper will then be washed using water sprays to clean them of residues of the electrolytic solution. After washing, the support bars are removed from the cathode plates using a cathode stripping machine so that they can be reused. The stripped cathode plates of LME grade copper are then stacked to form packs while the washing water will be directed to the barren solution makeup tank (200-TK-01). Spent electrolyte from the electrowinning cells is pumped back to the stripping circuit.

Figure 2-7 shows a typical copper cathode handling illustration.

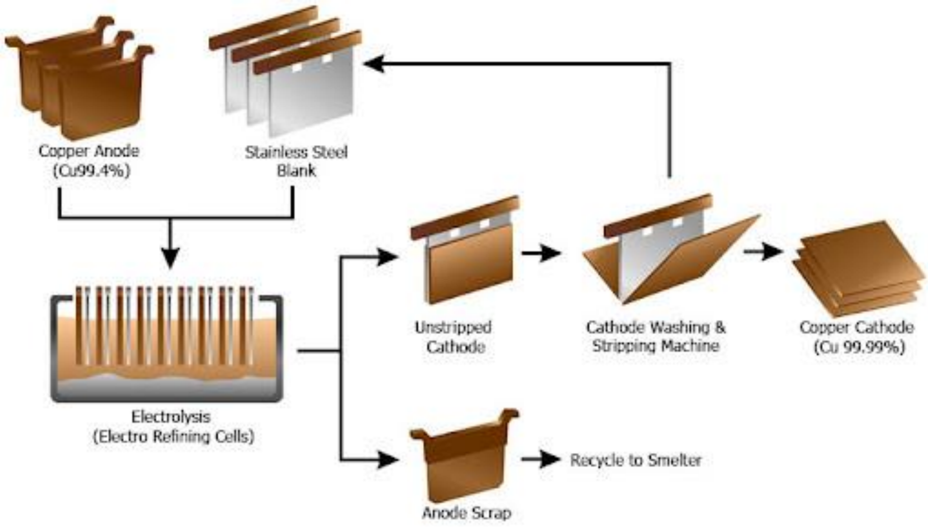

Figure 2-7 Typical Copper Cathode Handling (ptsmelting.com)

2.5.1 Electrolysis

The overall electrowinning reaction is:

Equation 12

$$CuSO_{4(aq)} + H_2O_{(l)} \rightarrow Cu_{(s)} + ½O_{2(g)} + H_2SO_{4(aq)}$$

The following electrode reactions take place at the cathode and anode:

Cathode (Reduction):

Equation 13

$$Cu^{2+}{}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$$

Anodes (Oxidation):

Equation 14

$$H_2O_{(l)} \rightarrow 4H^+_{(aq)} + {}^1/_2\, O_{2(g)} + +2e^-$$

Due to the similarities in Cu and Fe acid dissociation, iron ions can sometimes be found in the feed solution. Provisions must be made in the process to monitor, control and subsequently remove iron ions. This will ensure the required copper grade in the end-product is met, increase copper cathode production, and improve current efficiency in the electrowinning stage. For this project this will be done by continuously bleeding a portion of the iron-rich, copper-depleted electrolyte from the circuit, by pumping spent electrolyte solution to the Raffinate Pond (200-PO-05), Iron bleed (~1m^3/hr).

An illustration of electrolysis is given in Figure 2-8.

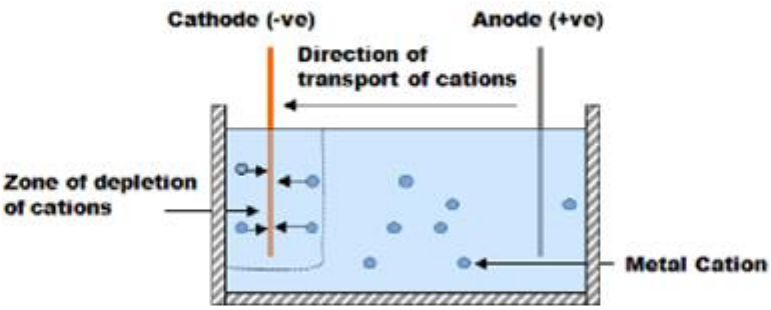

Figure 2-8 Electrowinning Process (Mooiman, et al., 2013)

2.5.2 Copper Sulphate Crystallisation

A portion of the strip solution, enriched in copper ions, is diverted from the Electrowinning Feed Tank (200-TK-04) into a Crystallisation Feed Tank (500-TK-01). Copper sulphate solution is fed to an Evaporative Crystalliser (500-CR-01) where the water is drawn off to leave behind a saturated copper sulphate solution with blue crystals of copper sulphate pentahydrate ($CuSO_4{\bullet}5H_2O$). When a high level of saturation is achieved, the solution is sent to the Copper Sulphate Centrifuge (500-CF-01) to collect the copper sulphate solids product. The mother liquor is recycled back into the stripping cell to recycle, and subsequently retain the uncrystallised copper sulphate. The solid product is sent to a Flash Dryer (500-FD-01), where water is further drawn off and the product is weighed and transferred using a Conveyor Belt System (500-CV-01) into product packaging into drums for shipping.

2.5.3 Leaching Solution Reconditioning

Barren solution from metal recovery circuits (solvent extraction and electrowinning) is collected in the Raffinate Pond (200-PO-05) in Area 200.The solution is then pumped into the Barren Solution Tank (200-TK-01) where it is reconditioned. This involves adjusting the acidity back to the targeted pH of 1-1.5 that is required for leaching by addition of concentrated acid. Leach solution reconditioning also includes bleeding, to lower the level of ore impurities (zinc, nickel) when they reach a point that is significantly affecting the process. The cycle time for this process will be developed during the pilot trial. Based on the test work, iron (III) sulphate can also be added to maintain an oxidation-reduction potential (ORP), which is crucial for optimising the leaching process.

2.6 Area 200: Tank and Pond Farm

Area 200 is the tank farm and pond area. This area will contain tanks and distribution pumps to facilitate the transfer of solutions between different processing areas. Ponds have been chosen to manage fluid volumes onsite because of their large storage capacity, cheaper costs and their management of flows around the ISCR field.

This area will also contain the reagent storage and preparation/makeup tanks.

Tanks in Area 200:

- 200-TK-01 Barren Solution Makeup Tank
- 200-TK-02 Pregnant Leach Solution Tank
- 200-TK-03 Solvent Extraction (SX) Feed Tank
- 200-TK-04 Electrowinning Feed Tank

Ponds and Thickeners in Area 200:

- 200-PO-01 Pregnant Leach Solution (PLS) Pond
- 200-PO-02 Intermediate Leach Solution (ILS) Pond
- 200-PO-03 Raw Water Pond
- 200-PO-04 Tailings Pond
- 200-PO-05 Raffinate Pond
- 200-TH-01 Thickener

Reagent Storage and Preparation in Area 200 for:

- Sulphuric Acid H_2SO_4
- Ferric Sulphide $Fe_2(SO_4)_3$
- Solvent Extraction Extractant and Diluent /Kerosene
- Sodium Chloride NaCl
- Sodium Carbonate Na_2CO_3
- BORAX $Na_2B_40_7.10H_2O$

2.6.1 Tank and Pond Farm Description

The Barren Solution Makeup Tank (200-TK-01) receives sulphuric acid from the Sulphuric Acid Tank (200-TK-08), Ferric sulphate from the Ferric Sulphate Silo (200-SI-01), possibly Sodium Chloride from the sodium chloride silo (200-SI-02) , raffinate solution from the raffinate pond (200-PO-05) ,and possibly intermediate leach solution from the ILS Pond (200-PO-02) to make a mixture that is feed to Area 100 (100-PP-01) to commence In-situ leaching.

The PLS Pond (pregnant leach solution pond) receives the PLS solution, rich in copper, from the Recovery Well Lift Pump (100-PP-02). The PLS pond will provide a larger buffer volume for managing PLS solution before pumping it to Pregnant Leach Solution Tank (200-TK-03) for storage via a thickener. From the Pregnant Leach Solution Pond (200-PO-01) the PLS is pumped to a Thickener (200-TH-01) to remove any solids from the PLS prior to silver precipitation and solvent extraction. Wash fluid from the Sand Filters (300-SF-01/02) in Area 300 is also pumped into the thickener for dewatering. The thickener overflow goes to the Pregnant Solution Tank (200-TK-01) whilst the underflow is pumped to a Tailings Pond (200-PO-04).

Depending on the PLS tenor the pregnant leach solution from the recovery wells is either sent to the PLS Pond (200-PO-01) or the ILS Pond (200-PO-02). PLS solution sent to the PLS pond is ready for downstream processing whilst solution sent to the ILS pond is not. The solution in the ILS pond is sent back to the wellfield to be used in a second leach cycle or added to the PLS pond if it has built up enough tenor for downstream processing. The ILS Pond (200-PO-02) generally provides a large buffer for leach solution make up and storage. It receives raw water from the Raw Water Pond (200-PO-03) and sometimes sulphuric acid from the Sulphuric Acid Tank (200-TK-06).

The solution tenor during the leaching process will be managed based on the ore grade, with levels estimated at a copper concentration of 1-5 g/l in the pregnant leach solution (PLS). Following solvent extraction, this solution will be concentrated to provide a copper tenor of 50-60 g/l for the electrowinning stage. After electrowinning, the exit solution will have a reduced copper concentration of approximately 3-5 g/l. These parameters will be refined and confirmed through test work and pilot trials to ensure optimal process efficiency and copper recovery.

The Raffinate Pond (200-PO-04) receives spent electrolyte, iron bleed at 1m^3/h, from the Electrowinning Cells (500-EW-01/02) in Area 500.This is done to control the amount of iron in the circuit by continuously bleeding a portion of the iron-rich, copper-depleted electrolyte from the electrowinning process. The pond also receives raffinate solution from the Solvent

Extraction Circuit (400-SX-01/02) in Area 400 after extraction of copper ions into the organic solution. Raffinate solution is pumped to the Barren Solution Tank (200-TK-01) in Area 100 where the solution will be distributed to the wellfield to leach the orebody.

The SX Feed Tank (200-TK-04) receives the Copper PLS after silver precipitation and recovery and feeds it into the SX circuit (400-SX-01/02/03) in Area 400. The Electrowinning Feed Tank (200-TK-05) will receive the purified copper electrolyte, advanced electrolyte, from the Stripping Circuit (400-ST-01) after filtration in Area 400 and feed it into the Copper Electrowinning Cells (500-EW-01/02) in Area 500.

Sodium Chloride is transferred to the PLS Silver Precipitation Feed Tank in Area 300 and the Barren Solution Tank in Area 200.

Figure 2-9 shows a possible layout for the tank farm for a ISCR operation.

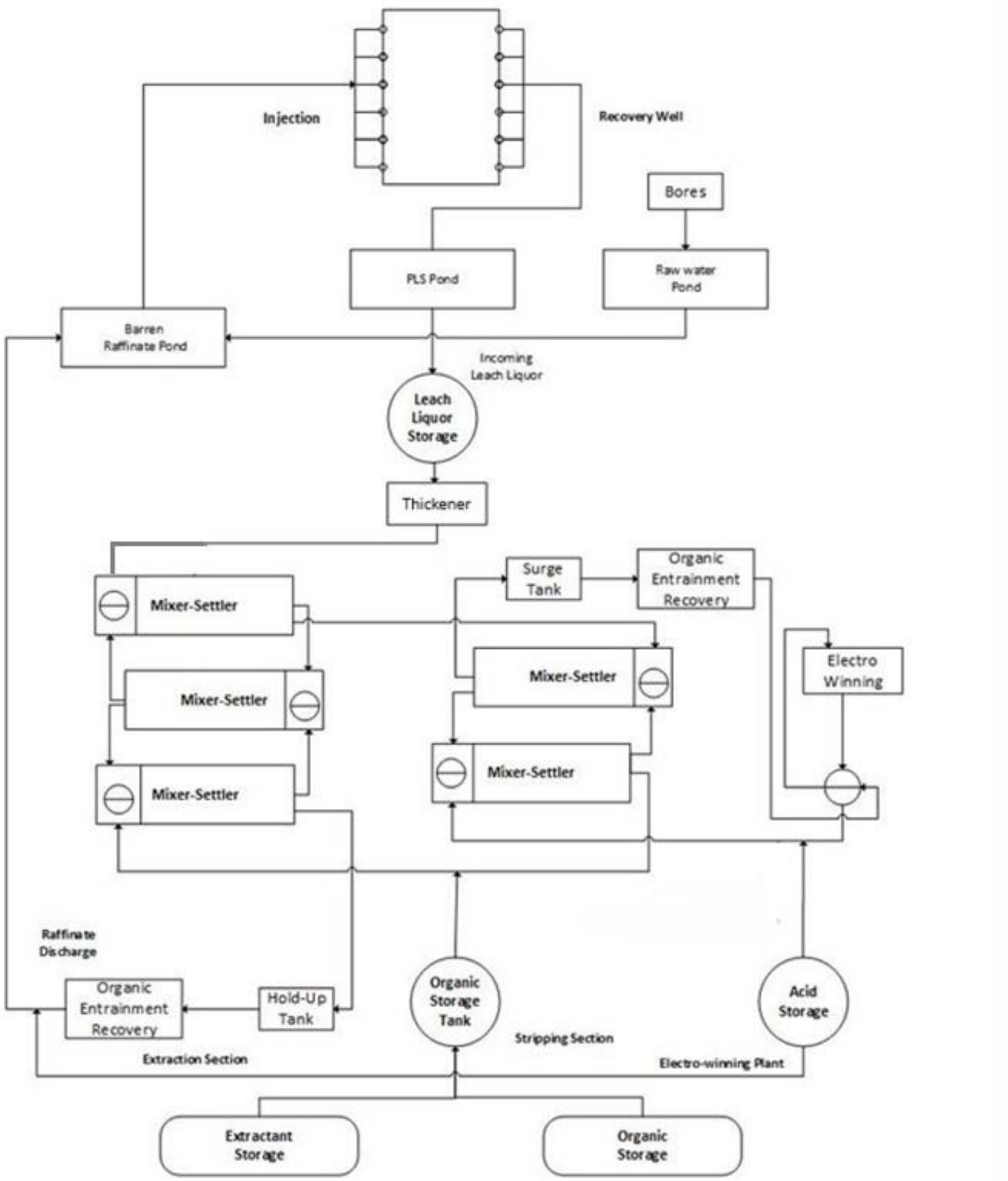

Figure 2-9 :Possible Tank Farm Layout

2.6.2 Process Reagents

- **Diluent/Kerosene**

  Kerosene is used as the bulk of the organic extracting phase. It is delivered by trucks and kept in the kerosene distribution tank until needed to make up fresh organic phase. Kerosene is stored in a steel tank Kerosene Storage Tank (200-TK-11) until it is pumped via metering pumps (duty/standby) to the Organic Feed Tank(400-TK-07) where it is mixed with the extractant.
- **Extractant**

  The extractant in the organic phase is delivered to the site in 1000 L isotainers and is kept in the isotainers until needed to make up fresh extractant. It is dispensed via metering pump (duty/standby) as required to the Organic Feed Tank (400-TK-07).
- **Sulphuric Acid**

  Sulphuric acid is tanked to the site and stored in an acid storage tank. Sulphuric acid is transferred via acid metering pumps and is used for leaching, pH adjustment, and for stripping liquor makeup. Hence sulphuric acid is pumped to the Stripping Circuit (400-ST-01) in Area 500 , Barren Solution Tank (200-TK-01) and the ILS Pond(200-PO-04), both in Area 200 as required.
- **Ferric Sulphate**

  Ferric Sulphate is trucked to the site in bags. Using a forklift the bags are transferred and emptied into a silo (200-SI-01) for storage. As needed this reagent is transferred into the Barren Solution Tank (200-TK-01) using a belt Conveyor (200-CV-01).
- **Sodium Chloride**

  Sodium Chloride is trucked to the site in bags. Using a forklift the bags are transferred and emptied into a Silo (200-SI-02) for storage. It is transferred to the PLS Silver Precipitation Feed Tank (300-TK-01) in Area 300 using a belt Conveyor (200-CV-02). It may be added to the barren raffinate if testwork shows it is beneficial for copper.
- **Borax**

  Borax which is used as a flux in silver smelting is trucked to the site in bags. Using a forklift the bags are transferred and emptied into the Smelting Furnace (300-FU-01).
- **Sodium Carbonate**

  Na_2CO_3 is used in silver production. It is trucked to the site in bags. Using a forklift the bags are transferred and emptied into the Na_2CO_3 Silo (200-SI-03) before it is transferred using a conveyor belt system to the Smelting Furnace (300-FU-01).

2.7 AREA 600 - SITE SERVICES

2.7.1 Air

Compressed air for the operation is treated air supplied from the atmosphere. It is passed through an Air Filter (600-AF-01) then into two Air Compressors (600-AC-01 and 600-AC-02) that feed into an Air Receiver (600-AR-01). Service air from the fist air receiver directly feeds the plants Service Air Header for distribution. A portion of the service air needs to be free of moisture particulates, dust and oil to function as Instrument air due to the sensitivity of instruments. To achieve the Instrument Air specification the service air is passed through an air filter system made up of two air filters and an air dryer. Air is passed through an Air Filter (600-AF-02) to remove additional particulates then fed into an Air Dryer (600-AD-01) to dry the air before finally passing the air through a final Air Filter (600-AF-03) before it goes into the Instrument Air Receiver (600-AR-02). This process will be designed to achieve the required instrument air specification. Compressed air is then distributed to the plant instruments via the instrument air header.

2.7.2 Water

2.7.2.1 Water Bore Supply

The water supply for the project will need to be provided using suitable quality bore water. This will require the drilling of boreholes by a specialist company, with installation of pumps powered by diesel gensets to draw the water from the ground. Tanks are placed close to the bores to provide effective water storage along with a contingent storage capacity at the site in the case of bore field downtime. Pumping pipes will be used to move water from the bore fields to the process plant and other project areas.

2.7.2.2 Water Treatment Plant

Water treatment for the site is expected to be undertaken using containerised water treatment systems. The plant is expected to comprise of two systems:

1. Bore Water Treatment Plant
2. Reverse Osmosis (RO) Treatment Plant

The Bore Water Treatment Plant will treat water received from the bores. The treatment plant will remove any solids in the inlet streams using a media filter to produce raw water used in plant processes; raw water pond, copper electrowinning, cathode washing, tailings pond, filter press, process solution heating, cooling and reagent dilution

A dedicated Fire Water Tank (600-TK-04) will be installed as part of a fire ring main and fire suppression system. Both the water treatment plants will produce a concentrated brine solution as waste. This concentrated brine solution is used for dust suppression activities for dust management onsite.

A portion of raw water is further treated in the RO plant to produce potable water. The potable water will be used for the site safety showers, offices, and workshops. The potable water for the plant will be stored in a tank capable of holding 24 hours of potable water for the staff on site.

Figure 2-10 shows a typical water treatment unit.

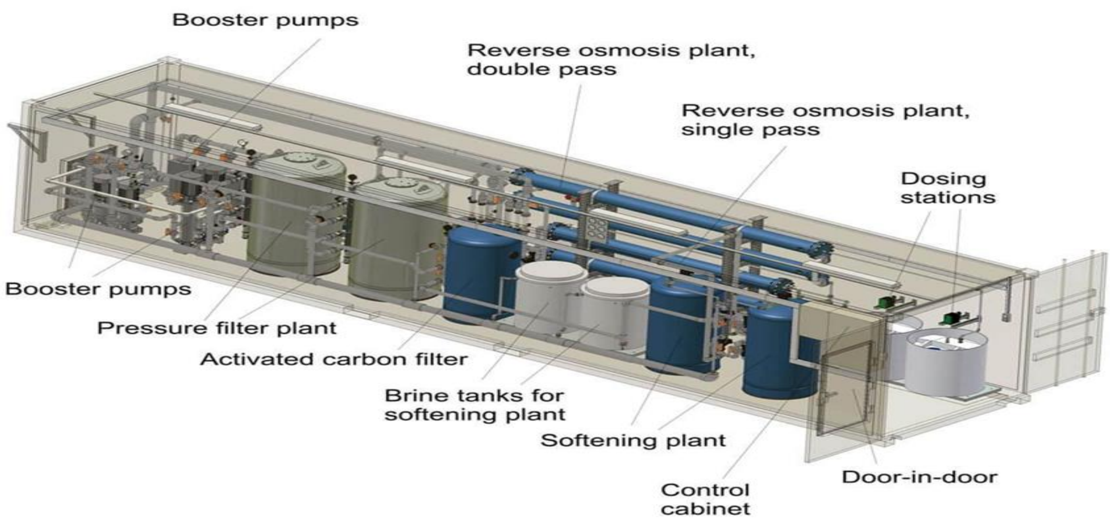

Figure 2-10 Typical Containerised Water Treatment Unit (acon-es.com)

2.7.3 Diesel

Diesel is delivered to the site via fuel trucks and unloaded using a diesel unloading pump (600-PP-01) directly into diesel storage tanks (600-TK-01 and 600-TK-02).The diesel storage tank (600-TK-01) feeds into a fast fill diesel bowser (600-DB-01) via a pump (600-PP-02).The bowser is then used to distribute diesel for plant use, to mobile equipment, site diesel transport and mobile diesel tanks. The Diesel Genset Storage (600-TK-02) will be used to store fuel for the diesel genset. The diesel offloading site has a fuel service safety shower (600-SW-01).

2.7.4 Power

The power used at the site for the project will be drawn primarily from the grid with a hybrid system proposed combining grid power and onsite diesel and renewable generation.

The diesel genset(s) will primarily be utilised for startup operation and backup in the case of emergency when the grid or renewable cannot meet demand.

The renewable power generation will be backed up with a battery storage to maximise renewable power utilisation. The power station (600-PS-01) at the plant will receive and distribute the power throughout the site using a controlling system (600-CS-01).

2.8 Metallurgical Accounting

Ongoing metallurgical accounting will be carried out to provide modelling, monitoring and diagnostic information to management enabling and assisting effective decision making to control and improve solution mining and metallurgical operations. The SCADA system will be used for the metallurgical accounting of the project. SCADA (supervisory control and data acquisition) is a control system that offers operator interfaces which enable remote-access monitoring and issuing of process commands. The metallurgical accounting programme will involve the following:

- Control/ monitor flows using flowmeters of all key solutions, including make-up of leachant, other reagents and water
- Sample solutions and assay
- Determine bacterial activity for sulphides
- Column leaches – data for projection of in-situ recovery performance
- Compare real data to modelled data for each wellfield
- Monitor/control leachant usage
- Update models with analyses if possible
- Determine metal balances
- Prepare production statement for products (LME Copper, Silver and Copper Sulphate)

2.8.1 Data Collection

The accuracy and reliability of the metallurgical accounting programme is relying on the accuracy of process data collected. The data collection for the process will include the following:

- Sampling solutions during different time intervals
- Solution analysis – metals, contaminants, leachant strength, solids, pH
- Monitor grade and mineralogy
- Monitoring and analysing onsite and offsite metallurgical test programs (leach box test/column tests) on drillhole samples from wellfield samples (development drilling) and exploration drilling.
- Metal content and key impurities in solutions

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Refinery ISA Process [Online]

APPENDIX C – Process Design Criteria

Appendix items

METS ENGINEERING
PROCESS + INNOVATION

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DOCUMENT COVER SHEET

CLIENT: Cobre Limited

PROJECT TITLE: Ngami Copper Project

PROJECT NO.: J5945

DOCUMENT TITLE: Process Design Criteria - Stage 1

DOCUMENT NO: J5945-P-PDC-000-001

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.		
CHECKING METHOD		CHECKING LEVEL
WORK INSTRUCTION / CHECKLIST NO.	OR	CH
	NAME	DATE
OR		
CH		

Rev	Date	Revision	By	Ch'k	Appv.
9	14/10/24	Issued for Information	EA	MN	DC
8	10/10/24	Issued for Client Review	EA	MN	DC
7	27/09/24	Issued for Client Review	XZ	MN	DC
6	24/09/24	Issued for Internal Review	XZ	MN	DC
5	18/09/24	Issued for Internal Review	XZ	MN	DC
4	16/09/24	Issued for Internal Review	SD	MN	DC
3	12/09/24	Issued for Internal Review	SD	JB	DC
2	10/09/24	Issued for Internal Review	SD	JB	DC
1	1/08/24	Issued for Internal Review	SD	XZ	DC
0	5/06/24	Draft Issued for Client Review	JK	MN	DC
B	28/05/24	Issued for Internal Review	JK	JB	DC
A	13/05/24	Issued for Internal Review	JK	MN	DC

SOURCE CODES

The following codes are used to reference the criteria.

CODE	SOURCE
1	Client Supplied Data
2	METS Calculated Value
3	METS Assumption
4	Specification
5	Testwork Supplied Data
6	Vendor Supplied Data
7	Other Sources

PLANT & EQUIPMENT CAPACITY

Nominal	Expected or typical throughput rate
Design	Maximum throughput rate

PLANT AREAS

100	Insitu Copper Recovery (ISCR) Wellfield
200	Tank Farm, Ponds and Reagents
300	Silver Precipitation
301	Silver Production
400	Solvent Extraction
500	Electrowining
501	Copper Sulphate Crystallisation
600	Site Services

ABBREVIATIONS FOR COMMON TERMS

Unit	Abbreviation/Symbol
ampere per square meter	A/m^2
average	ave
bed volume	BV
boiling point	bp
cubic meter	m^3
day	d
decibel	dB
degree Celsius	°C
degrees	deg
diameter	dia
direct current	dc
hectare	ha
hour	h
inside diameter	ID
kilogram	kg
kilogram per cubic meter	kg/m^3
kilowatthour	kWh
life of mine	LOM
litre	L
maximum	max
meter	m
meter above sea level	masl
meter per second	m/s
meter per second squared	m/s^2
metric ton	t
micron	mic
minimum	min
minute	min
mole percent	mol %
molecular mass (weight)	mol wt
parts per billion	ppb
parts per million	ppm
power factor	PF
run of mine	ROM
second	s
specific gravity	SG
square meter	m^2
temperature	T
tonnes per hour	t/h
volume	vol
volume by volume	v/v
weight (mass)	wt
weight (mass) percent	wt %
weight by mass	w/w
weight by volume	w/v
year	y

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
Production Targets						
Copper Production		t/a	1,903	-	3	METS Assumption
		Mlb/a	4	-	3	METS Assumption
Copper Recovery		%	36%	-	3	METS Assumption
Silver Production		t/a	1.88	-	3	METS Assumption
		oz/a	66,276	-	3	METS Assumption
Silver Recovery		%	20.4%	-	3	METS Assumption
Operating Criteria						
Design Life		years	3	-	3	METS Assumption
Days per Year		day	365	-	3	METS Assumption
Hours per Day		h	24	-	3	METS Assumption
Hours per year		h	8,760	-	3	METS Assumption
ISL Production Well Field Operating Hours		h/a	7,884	-	3	METS Assumption
ISL Production Well Field Nominal Rate		m^3/h	158	-	2	METS Calculated Value
ISL Production Well Field Availability		%	90%	-	3	METS Assumption
Silver Precipitation Plant Operating Hours		h/a	8,322		3	METS Assumption
Silver Precipitation Plant Nominal Rate		m^3/h	158		2	METS Calculated Value
Silver Precipitation Plant Availability		%	90.0%		3	METS Assumption
SX Plant Operating Hours		h/a	8,585	-	3	METS Assumption
SX Plant Nominal Rate		m^3/h	158.4	-	2	METS Calculated Value
SX Plant Availability		%	98%	-	3	METS Assumption
EW Plant Operating Hours		h/a	8,585	-	3	METS Assumption
EW Plant Nominal Rate		m^3/h	32.58	-	2	METS Calculated Value
EW Plant Availability		%	98%	-	3	METS Assumption
Water Treatment Plant Operating Hours		h/a	8,322	-	3	METS Assumption
Water Treatment Plant Nominal Rate		t/h	TBD	-	2	METS Calculated Value
Water Treatment Plant Availability		%	95%	-	3	METS Assumption
Site Characteristics						
Latitude		˚ S	21° 19' 11" South		1	Client Supplied Data
Longitude		˚ E	22° 15' 21" East		1	Client Supplied Data
Elevation		masl (m)	1145		8	Other Sources
Highest Monthly Rainfall Event		mm	TBD		8	Other Sources
Maximum high temperature		°C	35.0		8	Other Sources
Minimum low temperature		°C	17.0		8	Other Sources
Minimum Design temperature		°C	0		8	Other Sources
Maximum Design temperature		°C	50		8	Other Sources
Average Annual Precipitation		mm	29.1		8	Other Sources
Minimum Mean Monthly Precipitation	June	mm/month	0.0		8	Other Sources
Maximum Mean Monthly Precipitation	January	mm/month	85.1		8	Other Sources
Drainage 1 in 5 year storm event 72 hour rainfall		mm	TBD		8	Other Sources
Average Annual Evaporation		mm	TBD		8	Other Sources
Average Wind Speed		km/h	12.86		8	Other Sources
Annual Average Relative Humidity		%	40.3		8	Other Sources
Month Minimum Relative Humidity		%	19.8		8	Other Sources
Monthly Maximum Relative Humidity		%	52.5		8	Other Sources
Earthquake Zone Loading			Low to Moderate Risk		8	Other Sources
	Max	magnitude	6.5		8	Other Sources
	3 years	events	9		8	Other Sources
Days with no rain		days	303		8	Other Sources
Daylight hours		%	83.01%		8	Other Sources
Ore Characteristics						
Bulk Density (dry)		g/cm^3	2.77	-	3	METS Assumption
Density		g/cm^3	2.77	-	2	METS Calculated Value
Water Density		kg/m^3	1,000	-	3	METS Assumption
Ore Resource		tonnes	1,315,750		3	METS Assumption
Total Cu Head		%	0.4%		3	METS Assumption
Contained Copper		tonnes	5,263		2	METS Calculated Value
Silver Head Grade		ppm	7.00		3	METS Assumption
Contained Silver		tonnes	9.21		2	METS Calculated Value
		troy ounce	296,116		2	METS Calculated Value
Ore Content						
Cu	High Grade	%	2.76	-	5	Testwork Supplied Data
	Low Grade	%	0.55	-	5	Testwork Supplied Data
Ag	High Grade	ppm	24.08	-	5	Testwork Supplied Data
	Low Grade	ppm	13.72		5	Testwork Supplied Data
Ca	High Grade	ppm	17,219	-	5	Testwork Supplied Data

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Description		Units	Nominal	Design	Code	Source
	Low Grade	ppm	17,152		5	Testwork Supplied Data
Fe	High Grade	%	4.15	-	5	Testwork Supplied Data
	Low Grade	%	4.26		5	Testwork Supplied Data
Mg	High Grade	ppm	16,793	-	5	Testwork Supplied Data
	Low Grade	ppm	15,823		5	Testwork Supplied Data
Pb	High Grade	ppm	23.00	-	5	Testwork Supplied Data
	Low Grade	ppm	22.40		5	Testwork Supplied Data
Zn	High Grade	ppm	192.00	-	5	Testwork Supplied Data
	Low Grade	ppm	196.00		5	Testwork Supplied Data
Total Carbon	High Grade	%	0.55	-	5	Testwork Supplied Data
	Low Grade	%	0.48		5	Testwork Supplied Data
Non-Carbonate	High Grade	%	0.01	-	5	Testwork Supplied Data
	Low Grade	%	<0.01		5	Testwork Supplied Data
Carbonate	High Grade	%	0.54	-	5	Testwork Supplied Data
	Low Grade	%	0.48		5	Testwork Supplied Data
Total Sulfur	High Grade	%	0.65	-	5	Testwork Supplied Data
	Low Grade	%	0.12		5	Testwork Supplied Data
Sulfate	High Grade	%	0.01	-	5	Testwork Supplied Data
	Low Grade	%	<0.01		5	Testwork Supplied Data
Sulfide	High Grade	%	0.64	-	5	Testwork Supplied Data
	Low Grade	%	0.12		5	Testwork Supplied Data

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 100: ISCR Production Wellfield						
Well Field Design						
Wellfield Area		m^2	2500	-	1	Client Supplied Data
Well Spacing		m	100	-	1	Client Supplied Data
Number of Wells		-	5	-	3	METS Assumption
Production/ Injection Wells			Dual purpose	-	1	Client Supplied Data
Well Arrangement		-	Line Drive	-	1	Client Supplied Data
Drill Depth		m	260	-	1	Client Supplied Data
Flowrate per well	volumetric	L/s	3	-	1	Client Supplied Data
Maximum Wellfield PLS Flowrate	volumetric	m^3/h	159	-	2	METS Calculated Value
Concentration	Cu	g/L	1.58	-	2	METS Calculated Value
	Ag	ppm	1.39	-	2	METS Calculated Value
Injection Well Pump (100-PP-01)						
Flowrate	volumetric	L/s	43.87		2	METS Calculated Value
	volumetric	m^3/h	157.93		2	METS Calculated Value
	mass	t/h	158.05		2	METS Calculated Value
Injection Well (100-IW-01)						
Type		type	Directional		3	METS Assumption
Depth	vertical	m	260		3	METS Assumption
Diameter		mm	150		3	METS Assumption
Recovery Well (100-RW-01)						
Type		type	Vertical		3	METS Assumption
Depth		m	260		3	METS Assumption
Diameter		mm	150		3	METS Assumption
Recovery Well Lift Pump (100-PP-02)						
Flowrate	volumetric	L/s	44.01		2	METS Calculated Value
	volumetric	m^3/h	158.44		2	METS Calculated Value
	mass	t/h	158.58		2	METS Calculated Value

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 200: TANK FARM, PONDS AND REAGENTS						
Barren Solution Makeup Tank (200-TK-01)						
Flowrate		L/s	43.88		2	METS Calculated Value
	volumetric	m^3/h	157.96		2	METS Calculated Value
	mass	t/h	158.05		2	METS Calculated Value
Feed Breakdown						
Sulphuric Acid		L/s	0.03		2	METS Calculated Value
	volumetric	m^3/h	0.11		2	METS Calculated Value
	mass	t/h	0.21		2	METS Calculated Value
Ferric Sulphate		L/s	0.02		2	METS Calculated Value
	volumetric	m^3/h	0.09		2	METS Calculated Value
	mass	t/h	0.27		2	METS Calculated Value
Process Water		L/s	6.94		2	METS Calculated Value
	volumetric	m^3/h	24.97		2	METS Calculated Value
	mass	t/h	24.89		2	METS Calculated Value
Raffinate		L/s	36.89		2	METS Calculated Value
	volumetric	m^3/h	132.79		2	METS Calculated Value
	mass	t/h	132.68		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	315.92		2	METS Calculated Value
Pregnant Leach Solution Tank (200-TK-02)						
Flow Rate		L/s	43.95		2	METS Calculated Value
	volumetric	m^3/h	158.20		2	METS Calculated Value
	mass	t/h	158.22		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	316.41		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		2	METS Calculated Value
Solvent Extraction Feed Tank (200-TK-03)						
Flow Rate		L/s	44.00		2	METS Calculated Value
	volumetric	m^3/h	158.40		2	METS Calculated Value
	mass	t/h	158.42		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	316.80		2	METS Calculated Value
Electrowinning Feed Tank (200-TK-04)						
Flow Rate		L/s	9.05		2	METS Calculated Value
	volumetric	m^3/h	32.58		2	METS Calculated Value
	mass	t/h	33.51		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.03		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	65.15		2	METS Calculated Value
PLS Pond (200-PO-01)						
Flow Rate		L/s	44.01		2	METS Calculated Value
	volumetric	m^3/h	158.44		2	METS Calculated Value
	mass	t/h	158.58		2	METS Calculated Value
% Solids		% w/w	0.12		2	METS Calculated Value
Density		t/m^3	1.00		3	METS Assumption
Residence Time		h	24		3	METS Assumption
Pond Volume		m^3	3802		2	METS Calculated Value
Tailing Pond (200-PO-04)						
Flow Rate		L/s	0.06		2	METS Calculated Value
	volumetric	m^3/h	0.23		2	METS Calculated Value
	mass	t/h	0.35		2	METS Calculated Value
% Solids		% w/w	55.37		2	METS Calculated Value
Density		t/m^3	1.53		2	METS Calculated Value
Residence Time		h	34339		3	METS Assumption
Pond Volume		m^3	7988		3	METS Assumption
Raffinate Pond (200-PO-05)						
Flow Rate		L/s	36.89		2	METS Calculated Value
	volumetric	m^3/h	132.79		2	METS Calculated Value
	mass	t/h	132.68		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		3	METS Assumption
Residence Time		h	24.00		3	METS Assumption
Tank Volume		m^3	3187.07		2	METS Calculated Value

PLS Thickener (200-TH-01)						
Thickener Design						
Type of Thickener		type	high rate		3	METS Assumption
No. of Thickeners		number	1.00		3	METS Assumption
Liquor Density		t/m^3	1.20		3	METS Assumption
Solids Density		t/m^3	2.65		2	METS Calculated Value
Settling Rate		$m^2/t/h$	0.25	-	3	METS Assumption
Thickener Cross Sectional Area (Minimum)		m^2	39.64	-	2	METS Calculated Value
Thickener Diameter (Minimum)		m	7.10		2	METS Calculated Value
Upflow Rate		m/h	4.00	-	2	METS Calculated Value
Feed						
Feed Rate Slurry		L/s	44.01		2	METS Calculated Value
	volumetric	m^3/h	158.44		2	METS Calculated Value
	mass	t/h	158.58		3	METS Assumption
Feed Rate Solids		L/s	0.02		3	METS Assumption
	volumetric	m^3/h	0.07		2	METS Calculated Value
	mass	t/h	0.20		2	METS Calculated Value
Feed Rate Liquor		L/s	43.99		2	METS Calculated Value
	volumetric	m^3/h	158.36		2	METS Calculated Value
	mass	t/h	158.38		2	METS Calculated Value
Residence Time	time	h	0.50		2	METS Calculated Value
Volume		m^3	79		2	METS Calculated Value
Area		m^2	40		2	METS Calculated Value
% Solids		% w/w	0.12		3	METS Assumption
Density		t/m^3	1.00		3	METS Assumption
Underflow						
Underflow Slurry Rate		L/s	0.06		2	METS Calculated Value
	volumetric	m^3/h	0.23		2	METS Calculated Value
	mass	t/h	0.35		2	METS Calculated Value
Underflow Solids Rate		L/s	0.02		2	METS Calculated Value
	volumetric	m^3/h	0.07		2	METS Calculated Value
	mass	t/h	0.20		2	METS Calculated Value
Underflow Liquor Rate		L/s	0.04		3	METS Assumption
	volumetric	m^3/h	0.16		2	METS Calculated Value
	mass	t/h	0.16		2	METS Calculated Value
Underflow % Solids		% w/w	55.37		2	METS Calculated Value
Underflow Density		t/m^3	1.53		2	METS Calculated Value
Overflow						
Overflow Slurry Rate		L/s	43.95		2	METS Calculated Value
	volumetric	m^3/h	158.20		2	METS Calculated Value
	mass	t/h	158.22		2	METS Calculated Value
Overflow Solids Rate		L/s	0.00		2	METS Calculated Value
	volumetric	m^3/h	0.00		2	METS Calculated Value
	mass	t/h	0.00		2	METS Calculated Value
Overflow Liquor Rate		L/s	43.95		2	METS Calculated Value
	volumetric	m^3/h	158.20		2	METS Calculated Value
	mass	t/h	158.22		2	METS Calculated Value
Overflow % Solids		% w/w	0.00		2	METS Calculated Value
Overflow Density		t/m^3	1.00		2	METS Calculated Value
Flocculant						
Flocculant Dose Rate	ratio	g/t	100.00		3	METS Assumption
(Unit: gram of flocculant / ton of solid mass)						
Floc Rate		g/h	19.65		2	METS Calculated Value
Flocculant Make-up Concentration		% w/w	0.0025		3	METS Assumption
Sulphuric Acid (200-TK-05/06)						
Sulfuric Acid	ratio	lb/lb of Cu	0.86		3	METS Assumption
		L/s	0.03		2	METS Calculated Value
	volumetric	m^3/h	0.11		2	METS Calculated Value
	mass	t/h	0.21		2	METS Calculated Value
Annual Consumption		t/a	1629		2	METS Calculated Value
Residence Time		h	336		2	METS Calculated Value
Tank Volume		m^3	40.00		2	METS Calculated Value
Ferric Sulphate Silo (200-SI-01)						
Ferric Sulfate	ratio	lb/lb of Cu	1.12		5	Testwork Supplied Data
		L/s	0.02		2	METS Calculated Value
	volumetric	m^3/h	0.09		2	METS Calculated Value
	mass	t/h	0.27		2	METS Calculated Value
Annual Consumption		t/a	2131		2	METS Calculated Value
Residence Time		h	24.00		2	METS Calculated Value
Tank Volume		m^3	2.00		2	METS Calculated Value
Sodium Chloride Silo (200-SI-02)						
Sodium Chloride		L/s	0.05		2	METS Calculated Value
	volumetric	m^3/h	0.20		2	METS Calculated Value
	mass	t/h	0.20		2	METS Calculated Value
Residence Time		h	24.00		2	METS Calculated Value
Tank Volume		m^3	4.00		2	METS Calculated Value
Kerosene Storage Tank (200-TK-08)						
Type			Kerosene or equal		3	METS Assumption
		L/s	43.99		2	METS Calculated Value
	volumetric	m^3/h	128.13		2	METS Calculated Value
	mass	t/h	158.38		2	METS Calculated Value
	Residence Time	h	2.00		2	METS Calculated Value
	Volume	m^3	256		2	METS Calculated Value
Extractant						

Type			M5774 or equal		3	METS Assumption
Delivery Method			IBC		3	METS Assumption
Consumption	mass	t/h	TBD		3	METS Assumption
Flux						
Type			Borax Flux		3	METS Assumption
Delivery Method			Bulka Bags		3	METS Assumption
Consumption	mass	t/h	TBD		3	METS Assumption
Sodium Carbonate Silo (200-SI-03)						
Dosage		g/kg	369.76		3	METS Assumption
Consumption	mass	g/h	14.199		3	METS Assumption
	mass	g/a	118161		3	METS Assumption

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 300 SILVER PRECIPITATION						
Silver Precipitation Tank (300-TK-01)						
Flow Rate		L/s	44.00		2	METS Calculated Value
	volumetric	m^3/h	158.40		2	METS Calculated Value
	mass	t/h	158.42		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Feed Density		t/m^3	1.00		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	316		2	METS Calculated Value
Silver Precipitation						
Silver Chloride (AgCl)	volumetric	L/h	0.03		2	METS Calculated Value
	mass	g/h	144.46		2	METS Calculated Value
Clarifier (300-CF-01)						
Flow Rate		L/s	44.00		2	METS Calculated Value
	volumetric	m^3/h	158.40		2	METS Calculated Value
	mass	t/h	158.42		2	METS Calculated Value
		L/s	2.20		2	METS Calculated Value
Overflow Ratio	ratio	%	95%		3	METS Assumption
Overflow		L/s	41.80		2	METS Calculated Value
	volumetric	m^3/h	150.48		2	METS Calculated Value
	mass	t/h	150.50		2	METS Calculated Value
Underflow		L/s	2.20		2	METS Calculated Value
	volumetric	m^3/h	7.92		2	METS Calculated Value
	mass	t/h	7.92		2	METS Calculated Value
% Solids Underflow		% w/w	0.00		2	METS Calculated Value
Settling Rate		$m^2/t/h$	0.25	-	3	METS Assumption
% Solids Feed		% w/w	0.00		2	METS Calculated Value
Thickener Cross Sectional Area (Minimum)		m^2	39.61	-	2	METS Calculated Value
Tank Volume		m^3	79		2	METS Calculated Value
Filter Press Feed Tank (300-TK-02)						
Flow Rate		L/s	2.20		2	METS Calculated Value
To 300-PF-01	volumetric	m^3/h	7.92		2	METS Calculated Value
	mass	t/h	7.92		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.10		3	METS Assumption
Residence Time		h	8.00		3	METS Assumption
Tank Volume		m^3	64		2	METS Calculated Value
Silver Precipitation Press Filter (300-PF-01)						
Slurry Density		t/m^3	1.00		2	METS Calculated Value
Liquor Density		t/m^3	5.60		2	METS Calculated Value
Solids Density		t/m^3	5.60		2	METS Calculated Value
Filter Feed						
Filter Feed Rate Slurry		L/s	2.20		2	METS Calculated Value
	volumetric	m^3/h	7.92		2	METS Calculated Value
	mass	t/h	7.92		2	METS Calculated Value
Filter Feed Rate Solids		L/s	1.07E-05		2	METS Calculated Value
	volumetric	m^3/h	3.84E-05		2	METS Calculated Value
	mass	t/h	2.15E-04		2	METS Calculated Value
Filter Feed Rate Liquor		L/s	TBC			
	volumetric	m^3/h	TBC			
	mass	t/h	TBC			
Filter Feed % Solids		ppm	0.44		2	METS Calculated Value
Filter Feed Density		t/m^3	1.00		2	METS Calculated Value
Filter Solid Product						
Filter Cake Discharge Rate		L/s	1.07E-05		2	METS Calculated Value
	volumetric	m^3/h	3.84E-05		2	METS Calculated Value
	mass	t/h	2.15E-04		2	METS Calculated Value
	mass (kg/h)	kg/h	0.215		2	METS Calculated Value
Filter Cake Discharge Rate Liquor		L/s	0.00		2	METS Calculated Value
	volumetric	m^3/h	0.00		2	METS Calculated Value
	mass	t/h	0.00		2	METS Calculated Value
Filter Cake Discharge Rate Solids		L/s	1.07E-05		2	METS Calculated Value
	volumetric	m^3/h	3.84E-05		2	METS Calculated Value
	mass	t/h	2.15E-04		2	METS Calculated Value
Filter Cake Discharge % Solids		% w/w	100.00		3	METS Assumption
Filter Cake Solid Discharge Density		t/m^3	5.60		2	METS Calculated Value
Filter Liquor Product						
Filtrate Discharge Rate		L/s	2.20		2	METS Calculated Value
	volumetric	m^3/h	7.92		2	METS Calculated Value
	mass	t/h	7.92		2	METS Calculated Value
Filtrate Discharge Rate Liquor		L/s	2.20		2	METS Calculated Value

	volumetric	m^3/h	7.92		2	METS Calculated Value
	mass	t/h	7.92		2	METS Calculated Value
Filtrate Discharge Rate Solids		L/s	0.00		2	METS Calculated Value
	volumetric	m^3/h	0.00		2	METS Calculated Value
	mass	t/h	0.00		2	METS Calculated Value
Filtrate Discharge % Solids		% w/w	0.00		2	METS Calculated Value
Filtrate Discharge Density		t/m^3	1.00		2	METS Calculated Value
Filter Press Filtrate Tank (300-TK-03)						
Flow Rate		L/s	44.00		2	METS Calculated Value
	volumetric	m^3/h	158.40		2	METS Calculated Value
	mass	t/h	158.42		2	METS Calculated Value
Feed Streams In						
Filtrate 300-PF-01		L/s	2.20		2	METS Calculated Value
	volumetric	m^3/h	7.92		2	METS Calculated Value
	mass	t/h	7.92		2	METS Calculated Value
Clarifier 300-CF-01 Overflow		L/s	41.80		2	METS Calculated Value
	volumetric	m^3/h	150.48		2	METS Calculated Value
	mass	t/h	150.50		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	316.00		2	METS Calculated Value
Silver Precipitation Sand Filter (300-SF-01/02)						
Flow Rate		L/s	44.00		2	METS Calculated Value
	volumetric	m^3/h	158.40		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		2	METS Calculated Value
Residence Time		h	0.10		3	METS Assumption
Tank Volume		m^3	16.00		2	METS Calculated Value
Clarifier Feed Tank (300-TK-04)						
Flow Rate		L/s	44.00		2	METS Calculated Value
	volumetric	m^3/h	158.40		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	316.00		2	METS Calculated Value
Clarifier (300-CF-02)						
Flow Rate		L/s	44.00		2	METS Calculated Value
	volumetric	m^3/h			2	METS Calculated Value
Settling Rate		$m^2/t/h$	0.25	-	3	METS Assumption
Thickener Cross Sectional Area (Minimum)		m^2	39.61	-	2	METS Calculated Value
Volume		m^3	79.21		2	METS Calculated Value
Smelting Furnace (300-FU-01)						
AgCl Feed		kg/h	0.215		2	METS Calculated Value
Operation			Batch		3	METS Assumption
Furnace Size			TBD		3	METS Assumption
Silver Production		kg/h	0.162		2	METS Calculated Value

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 400 SOLVENT EXTRACTION						
Organic Feed Tank (400-TK-01)						
Flow Rate		L/s	43.99		2	METS Calculated Value
Organic Extractant and Diluent	volumetric	m^3/h	128.13		2	METS Calculated Value
	mass	t/h	158.38		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	0.81		2	METS Calculated Value
Residence Time		h	3.00		3	METS Assumption
		m^3	384.00		2	METS Calculated Value
Copper Extraction Mixer Settler (400-SX-01/02)						
Number of Cells		#	3.00		3	METS Assumption
Volume/Cell Minimum (Mixer)		m^3	2.20		2	METS Calculated Value
Volume/Cell Minimum (Settler)		m^3	11.73		2	METS Calculated Value
Residence Time (Mixer)		min	1.50		3	METS Assumption
Residence Time (Settler)		min	8.00		3	METS Assumption
Mixer Diameter		TBD	TBD		3	METS Assumption
Mixer Height		TBD	TBD		3	METS Assumption
Settler Width		TBD	TBD		3	METS Assumption
Settler Area Settler Length		TBD	TBD		3	METS Assumption
Temperature		°C	Ambient		3	METS Assumption
SX O:A Ratio		O:A	0.81		2	METS Calculated Value
SX Feed Flow		L/s	87.99		2	METS Calculated Value
Total Feed	volumetric	m^3/h	316.78		2	METS Calculated Value
	mass	t/h	286.55		2	METS Calculated Value
Feed Streams In						
PLS Feed		L/s	44.00		2	METS Calculated Value
	volumetric	m^3/h	158.40		2	METS Calculated Value
	mass	t/h	158.42		2	METS Calculated Value
Organic Feed Rate		L/s	43.99		2	METS Calculated Value
	volumetric	m^3/h	158.38		2	METS Calculated Value
	mass	t/h	128.13		2	METS Calculated Value
SX Exit Flow		L/s	102.88		2	METS Calculated Value
Total Exit	volumetric	m^3/h	370.36		2	METS Calculated Value
	mass	t/h	340.16		2	METS Calculated Value
Exit Streams Out						
Raffinate Exit Flow		L/s	43.93		2	METS Calculated Value
To Raffinate Pond 200-PO-05	volumetric	m^3/h	158.16		2	METS Calculated Value
	mass	t/h	158.19		2	METS Calculated Value
Loaded Orgranic to Stripping Circuit		L/s	44.05		2	METS Calculated Value
To Stripping Circuit 400-ST-01/02	volumetric	m^3/h	158.59		2	METS Calculated Value
	mass	t/h	128.36		2	METS Calculated Value
Acid Loss		L/s	14.89		2	METS Calculated Value
	volumetric	m^3/h	53.61		2	METS Calculated Value
	mass	t/h	53.61		2	METS Calculated Value
Aqueous Parameters						
pH Initial		pH	1.50		3	METS Assumption
Organic Parameters						
Organic Loss Rate		%	0.001%		3	METS Assumption
		m^3/h	0.0016		3	METS Assumption
Loaded Organic Discharge Rate		m^3/h	158.59		2	METS Calculated Value
Organic in Diluent		%	15%		3	METS Assumption
Copper Stripping Circuit (400-ST-01/02)						
Number of Cells		#	2.00		3	METS Assumption
Volume/Cell Minimum (Mixer)		m^3	4.78		2	METS Calculated Value
Volume/Cell Minimum (Settler)		m^3	25.49		2	METS Calculated Value
Residence Time (Mixer)		min	1.50		3	METS Assumption
Residence Time (Settler)		min	8.00		3	METS Assumption
Temperature		°C	Ambient		3	METS Assumption
Stripping Efficiency		%	100.00		3	METS Assumption
ST O/A Ratio		O:A	4.87		2	METS Calculated Value
ST Feed Flow		L/s	53.09		2	METS Calculated Value
Total Feed	volumetric	m^3/h	191.14		2	METS Calculated Value
	mass	t/h	161.63		2	METS Calculated Value
Feed Streams In						
Loaded Organic Feed Rate		L/s	44.05		2	METS Calculated Value
From Extraction Circuit 400-SX-01/02	volumetric	m^3/h	158.59		2	METS Calculated Value
	mass	t/h	128.36		2	METS Calculated Value
Stripping Solution Feed		L/s	9.04		2	METS Calculated Value
From EW 500-EW-01/02	volumetric	m^3/h	32.55		2	METS Calculated Value
	mass	t/h	33.27		2	METS Calculated Value
ST Exit Flow		L/s	53.00		2	METS Calculated Value
Total Exit	volumetric	m^3/h	190.81		2	METS Calculated Value
	mass	t/h	161.63		2	METS Calculated Value
Exit Streams Out						
Electrolyte		L/s	9.05		2	METS Calculated Value

To Electrowinning Feed Tank 200-TK-04	volumetric	m^3/h	32.58		2	METS Calculated Value
	mass	t/h	33.51		2	METS Calculated Value
Diluent Recycle		L/s	43.95		2	METS Calculated Value
	volumetric	m^3/h	158.23		2	METS Calculated Value
	mass	t/h	128.12		2	METS Calculated Value
Aqueous Parameters						
Stripping Solution Feed Rate		m^3/h	32.55		2	METS Calculated Value
Aqueous Discharge Rate		m^3/h	32.58		2	METS Calculated Value
Organic Parameters						
Loaded Organic Feed Rate		m^3/h	158.59		2	METS Calculated Value
Organic Discharge Rate		m^3/h	158.23		2	METS Calculated Value

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 500 ELECTROWINNING & CRYSTALLISATION						
Electrowinning (500-EW-01/02)						
Number of Cells		#	1		2	METS Calculated Value
Electrowin Time		days	TBD	-	3	METS Assumption
Cell Volume		m^3	TBD	-	3	METS Assumption
Flowrate	(per cell)	m^3/h	50	-	2	METS Calculated Value
Feed Flow Rate	(per cell)	L/s	14	-	2	METS Calculated Value
Cell Feed Copper Concentration		g/L	40	-	3	METS Assumption
Electrowinning Copper Recovery		%	99.00%	-	3	METS Assumption
Copper Production		t/h	0.25		2	METS Calculated Value
		tonnes/annum	2,047	-	3	METS Assumption
		Mlb/a	5	-	3	METS Assumption
Cell Voltage		V	2		3	METS Assumption
Cathode Material		-	SS Blank Cathodes	-	4	Specification
Cathode Cleaning		-	High Pressure Water	-	4	Specification
Cathode Cleaning Frequency		per week	1	-	3	METS Assumption
Water Requirement for Cathode Cleaning		m^3/clean	15	-	3	METS Assumption
Electrowinning Efficiency		%	100	-	3	METS Assumption
Temperature		°C	50-60		3	METS Assumption
EW Feed		L/s	9.05		2	METS Calculated Value
Electrolyte	volumetric	m^3/h	32.58		2	METS Calculated Value
	mass	t/h	33.51		2	METS Calculated Value
EW Products		L/s	9.05		2	METS Calculated Value
	volumetric	m^3/h	32.58		2	METS Calculated Value
	mass	t/h	33.51		2	METS Calculated Value
Exit Streams Out						
To Stripping Circuit 400-ST-01/02		L/s	9.04		2	METS Calculated Value
	volumetric	m^3/h	32.55		2	METS Calculated Value
	mass	t/h	33.27		2	METS Calculated Value
Copper Cathode		L/s	0.01		2	METS Calculated Value
	volumetric	m^3/h	0.03		2	METS Calculated Value
	mass	t/h	0.25		2	METS Calculated Value
Crystallisation Feed Tank (500-TK-01)						
Operation Mode			Alternative			
Ratio of SX Eluate to Crystallisation		%	40%		3	METS Assumption
Feed Rate of SX Eluate to Crystalliser		m^3/h	13.03	-	2	METS Calculated Value
Residence Time of Crystalliser Feed Tank		hours	2.0	-	3	METS Assumption
Crystallisier Feed Tank Volume		m^3	26.1	-	3	METS Assumption
Flow Rate		L/s	3.62		2	METS Calculated Value
To 500-CR-01 Crystalliser	volumetric	m^3/h	13.03		2	METS Calculated Value
	mass	t/h	13.40		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.03		2	METS Calculated Value
Residence Time		h	3.00		3	METS Assumption
Tank Volume		m^3	39.09		2	METS Calculated Value
		L/s	26.06		2	METS Calculated Value
Crystalliser (500-CR-01)						
Crystalliser Feed		L/s	3.62		2	METS Calculated Value
	volumetric	m^3/h	13.03		2	METS Calculated Value
	mass	t/h	13.40		2	METS Calculated Value
Crystalliser Design						
Crystalliser Type			Forced Circulation		3	METS Assumption
pH control			pH 2 to 4		3	METS Assumption
Operating Temperature		K	TBD		3	METS Assumption
Residence Time		h	0.50		3	METS Assumption
Crystalliser Volume		m^3	6.52		2	METS Calculated Value
Copper Sulphate Centrifuge (500-CF-01)						
Feed Rate		L/s	4		2	METS Calculated Value
Cu Concentration		g/L	40		2	METS Calculated Value
Copper Feed Rate		kg/h	521		2	METS Calculated Value
Cu to Copper Sulphate			4		2	METS Calculated Value
Feed Rate of SX Eluate to Crystalliser		kg/h	2,048	-	2	METS Calculated Value
Flash Dryer (500-FD-01)						
Feed Rate		kg/h	2,048	-	2	METS Calculated Value

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DOCUMENT COVER SHEET

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PROJECT TITLE: Ngami Copper Project

PROJECT NO.: J5945

DOCUMENT TITLE: Process Design Criteria - Stage 2

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THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.			
CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH
	NAME	DATE	
OR			
CH			

Rev	Date	Revision	By	Ch'k	Appv.
9	14/10/24	Issued for Information	EA	MN	DC
8	4/10/24	Draft Issued for Client Review	EA	MN	DC
7	27/09/24	Draft Issued for Client Review	XZ	MN	DC
6	24/09/24	Issued for Internal Review	XZ	MN	DC
5	18/09/24	Issued for Internal Review	XZ	MN	DC
4	16/09/24	Issued for Internal Review	SD	MN	DC
3	12/09/24	Issued for Internal Review	SD	JB	DC
2	10/09/24	Issued for Internal Review	SD	JB	DC
1	1/08/24	Issued for Internal Review	SD	XZ	DC
0	5/06/24	Draft Issued for Client Review	JK	MN	DC
B	28/05/24	Issued for Internal Review	JK	JB	DC
A	13/05/24	Issued for Internal Review	JK	MN	DC

SOURCE CODES

The following codes are used to reference the criteria.

CODE	SOURCE
1	Client Supplied Data
2	METS Calculated Value
3	METS Assumption
4	Specification
5	Testwork Supplied Data
6	Vendor Supplied Data
7	Other Sources

PLANT & EQUIPMENT CAPACITY

Nominal	Expected or typical throughput rate
Design	Maximum throughput rate

PLANT AREAS

100	Insitu Copper Recovery (ISCR) Wellfield
200	Tank Farm, Ponds and Reagents
300	Silver Precipitation
301	Silver Production
400	Solvent Extraction
500	Electrowining
501	Copper Sulphate Crystallisation
600	Site Services

ABBREVIATIONS FOR COMMON TERMS

Unit	Abbreviation/Symbol
ampere per square meter	A/m^2
average	ave
bed volume	BV
boiling point	bp
cubic meter	m^3
day	d
decibel	dB
degree Celsius	°C
degrees	deg
diameter	dia
direct current	dc
hectare	ha
hour	h
inside diameter	ID
kilogram	kg
kilogram per cubic meter	kg/m^3
kilowatthour	kWh
life of mine	LOM
litre	L
maximum	max
meter	m
meter above sea level	masl
meter per second	m/s
meter per second squared	m/s^2
metric ton	t
micron	mic
minimum	min
minute	min
mole percent	mol %
molecular mass (weight)	mol wt
parts per billion	ppb
parts per million	ppm
power factor	PF
run of mine	ROM
second	s
specific gravity	SG
square meter	m^2
temperature	T
tonnes per hour	t/h
volume	vol
volume by volume	v/v
weight (mass)	wt
weight (mass) percent	wt %
weight by mass	w/w
weight by volume	w/v
year	y

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
Production Targets						
Copper Production		t/a	39,998	-	3	METS Assumption
		Mlb/a	88	-	3	METS Assumption
Copper Recovery		%	36%	-	3	METS Assumption
Silver Production		t/a	39.49	-	3	METS Assumption
		oz/a	1,393,055	-	3	METS Assumption
Silver Recovery		%	20.4%	-	3	METS Assumption
Operating Criteria						
Design Life		years	4	-	3	METS Assumption
Days per Year		day	365	-	3	METS Assumption
Hours per Day		h	24	-	3	METS Assumption
Hours per year		h	8,760	-	3	METS Assumption
ISL Production Well Field Operating Hours		h/a	7,884	-	3	METS Assumption
ISL Production Well Field Nominal Rate		m^3/h	3,320	-	2	METS Calculated Value
ISL Production Well Field Availability		%	90%	-	3	METS Assumption
Silver Precipitation Plant Operating Hours		h/a	8,322		3	METS Assumption
Silver Precipitation Plant Nominal Rate		m^3/h	3,329		2	METS Calculated Value
Silver Precipitation Plant Availability		%	90.0%		3	METS Assumption
SX Plant Operating Hours		h/a	8,585	-	3	METS Assumption
SX Plant Nominal Rate		m^3/h	3,329.4	-	2	METS Calculated Value
SX Plant Availability		%	98%	-	3	METS Assumption
EW Plant Operating Hours		h/a	8,585	-	3	METS Assumption
EW Plant Nominal Rate		m^3/h	684.72	-	2	METS Calculated Value
EW Plant Availability		%	98%	-	3	METS Assumption
Water Treatment Plant Operating Hours		h/a	8,322	-	3	METS Assumption
Water Treatment Plant Nominal Rate		t/h	TBD	-	2	METS Calculated Value
Water Treatment Plant Availability		%	95%	-	3	METS Assumption
Site Characteristics						
Latitude		˚ S	21° 19' 11" South		1	Client Supplied Data
Longitude		˚ E	22° 15' 21" East		1	Client Supplied Data
Elevation		masl (m)	1145		8	Other Sources
Highest Monthly Rainfall Event		mm	TBD		8	Other Sources
Maximum high temperature		°C	35.0		8	Other Sources
Minimum low temperature		°C	17.0		8	Other Sources
Minimum Design temperature		°C	0		8	Other Sources
Maximum Design temperature		°C	50		8	Other Sources
Average Annual Precipitation		mm	29.1		8	Other Sources
Minimum Mean Monthly Precipitation	June	mm/month	0.0		8	Other Sources
Maximum Mean Monthly Precipitation	January	mm/month	85.1		8	Other Sources
Drainage 1 in 5 year storm event 72 hour rainfall		mm	TBD		8	Other Sources
Average Annual Evaporation		mm	TBD		8	Other Sources
Average Wind Speed		km/h	12.86		8	Other Sources
Annual Average Relative Humidity		%	40.3		8	Other Sources
Month Minimum Relative Humidity		%	19.8		8	Other Sources
Monthly Maximum Relative Humidity		%	52.5		8	Other Sources
Earthquake Zone Loading			Low to Moderate Risk		8	Other Sources
	Max	magnitude	6.5		8	Other Sources
	3 years	events	9		8	Other Sources
Days with no rain		days	303		8	Other Sources
Daylight hours		%	83.01%		8	Other Sources
Ore Characteristics						
Bulk Density (dry)		g/cm^3	2.77	-	3	METS Assumption
Density		g/cm^3	2.77	-	2	METS Calculated Value
Water Density		kg/m^3	1,000	-	3	METS Assumption
Resource Under Leach		tonnes	27,655,749		3	METS Assumption
Total Cu Head		%	0.4%		3	METS Assumption
Contained Copper		tonnes	110,623		2	METS Calculated Value
Silver Head Grade		ppm	7.00		3	METS Assumption
Contained Silver		tonnes	193.59		2	METS Calculated Value
		troy ounce	6,224,062		2	METS Calculated Value
Ore Content						
Cu	High Grade	%	2.76	-	5	Testwork Supplied Data
	Low Grade	%	0.55	-	5	Testwork Supplied Data
Ag	High Grade	ppm	24.08	-	5	Testwork Supplied Data
	Low Grade	ppm	13.72		5	Testwork Supplied Data
Ca	High Grade	ppm	17,219	-	5	Testwork Supplied Data

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
	Low Grade	ppm	17,152		5	Testwork Supplied Data
Fe	High Grade	%	4.15	-	5	Testwork Supplied Data
	Low Grade	%	4.26		5	Testwork Supplied Data
Mg	High Grade	ppm	16,793	-	5	Testwork Supplied Data
	Low Grade	ppm	15,823		5	Testwork Supplied Data
Pb	High Grade	ppm	23.00	-	5	Testwork Supplied Data
	Low Grade	ppm	22.40		5	Testwork Supplied Data
Zn	High Grade	ppm	192.00	-	5	Testwork Supplied Data
	Low Grade	ppm	196.00		5	Testwork Supplied Data
Total Carbon	High Grade	%	0.55	-	5	Testwork Supplied Data
	Low Grade	%	0.48		5	Testwork Supplied Data
Non-Carbonate	High Grade	%	0.01	-	5	Testwork Supplied Data
	Low Grade	%	<0.01		5	Testwork Supplied Data
Carbonate	High Grade	%	0.54	-	5	Testwork Supplied Data
	Low Grade	%	0.48		5	Testwork Supplied Data
Total Sulfur	High Grade	%	0.65	-	5	Testwork Supplied Data
	Low Grade	%	0.12		5	Testwork Supplied Data
Sulfate	High Grade	%	0.01	-	5	Testwork Supplied Data
	Low Grade	%	<0.01		5	Testwork Supplied Data
Sulfide	High Grade	%	0.64	-	5	Testwork Supplied Data
	Low Grade	%	0.12		5	Testwork Supplied Data

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 100: ISCR Production Wellfield						
Well Field Design						
Wellfield Length		m	10510	-	1	Client Supplied Data
Well Spacing		m	100	-	1	Client Supplied Data
Number of Wells		-	105	-	3	METS Assumption
Production/ Injection Wells			Dual purpose	-	1	Client Supplied Data
Well Arrangement		-	Line Drive	-	1	Client Supplied Data
Drill Depth		m	260	-	1	Client Supplied Data
Flowrate per well	volumetric	L/s	3	-	1	Client Supplied Data
Maximum Wellfield PLS Flowrate	volumetric	m^3/h	1135	-	2	METS Calculated Value
Concentration	Cu	g/L	1.58	-	2	METS Calculated Value
	Ag	ppm	1.39	-	2	METS Calculated Value
Injection Well Pump (100-PP-01)						
Flowrate	volumetric	L/s	922.11		2	METS Calculated Value
	volumetric	m^3/h	3319.58		2	METS Calculated Value
	mass	t/h	3322.07		2	METS Calculated Value
Injection Well (100-IW-01)						
Type		type	Directional		3	METS Assumption
Depth	vertical	m	260		3	METS Assumption
Diameter		mm	150		3	METS Assumption
Recovery Well (100-RW-01)						
Type		type	Vertical		3	METS Assumption
Depth		m	260		3	METS Assumption
Diameter		mm	150		3	METS Assumption
Recovery Well Lift Pump (100-PP-02)						
Flowrate	volumetric	L/s	925.05		2	METS Calculated Value
	volumetric	m^3/h	3330.17		2	METS Calculated Value
	mass	t/h	3333.14		2	METS Calculated Value

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 200: TANK FARM, PONDS AND REAGENTS						
Barren Solution Makeup Tank (200-TK-01)						
Flowrate		L/s	922.27		2	METS Calculated Value
	volumetric	m^3/h	3320.19		2	METS Calculated Value
	mass	t/h	3322.07		2	METS Calculated Value
Feed Breakdown						
Sulphuric Acid		L/s	0.66		2	METS Calculated Value
	volumetric	m^3/h	2.37		2	METS Calculated Value
	mass	t/h	4.34		2	METS Calculated Value
Ferric Sulphate		L/s	0.51		2	METS Calculated Value
	volumetric	m^3/h	1.83		2	METS Calculated Value
	mass	t/h	5.68		2	METS Calculated Value
Process Water		L/s	145.77		2	METS Calculated Value
	volumetric	m^3/h	524.77		2	METS Calculated Value
	mass	t/h	523.22		2	METS Calculated Value
Raffinate		L/s	775.34		2	METS Calculated Value
	volumetric	m^3/h	2791.21		2	METS Calculated Value
	mass	t/h	2788.82		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	6640.38		2	METS Calculated Value
Pregnant Leach Solution Tank (200-TK-02)						
Flow Rate		L/s	923.69		2	METS Calculated Value
	volumetric	m^3/h	3325.28		2	METS Calculated Value
	mass	t/h	3325.68		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	6650.55		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		2	METS Calculated Value
Solvent Extraction Feed Tank (200-TK-03)						
Flow Rate		L/s	924.84		2	METS Calculated Value
	volumetric	m^3/h	3329.42		2	METS Calculated Value
	mass	t/h	3329.88		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	6658.83		2	METS Calculated Value
Electrowinning Feed Tank (200-TK-04)						
Flow Rate		L/s	190.20		2	METS Calculated Value
	volumetric	m^3/h	684.72		2	METS Calculated Value
	mass	t/h	704.26		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.03		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	1369.43		2	METS Calculated Value
PLS Pond (200-PO-01)						
Flow Rate		L/s	925.05		2	METS Calculated Value
	volumetric	m^3/h	3330.17		2	METS Calculated Value
	mass	t/h	3333.14		2	METS Calculated Value
% Solids		% w/w	0.12		2	METS Calculated Value
Density		t/m^3	1.00		3	METS Assumption
Residence Time		h	24		3	METS Assumption
Pond Volume		m^3	79924		2	METS Calculated Value
Tailing Pond (200-PO-04)						
Flow Rate		L/s	1.36		2	METS Calculated Value
	volumetric	m^3/h	4.89		2	METS Calculated Value
	mass	t/h	7.46		2	METS Calculated Value
% Solids		% w/w	55.37		2	METS Calculated Value
Density		t/m^3	1.53		2	METS Calculated Value
Residence Time		h	34339		3	METS Assumption
Pond Volume		m^3	167890		3	METS Assumption
Raffinate Pond (200-PO-05)						
Flow Rate		L/s	775.34		2	METS Calculated Value
	volumetric	m^3/h	2791.21		2	METS Calculated Value
	mass	t/h	2788.82		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.00		3	METS Assumption
Residence Time		h	24.00		3	METS Assumption
Tank Volume		m^3	66989.13		2	METS Calculated Value

PLS Thickener (200-TH-01)						
Thickener Design						
Type of Thickener		type	high rate		3	METS Assumption
No. of Thickeners		number	1.00		3	METS Assumption
Liquor Density		t/m^3	1.20		3	METS Assumption
Solids Density		t/m^3	2.65		2	METS Calculated Value
Settling Rate		$m^2/t/h$	0.25	-	3	METS Assumption
Thickener Cross Sectional Area (Minimum)		m^2	833.28	-	2	METS Calculated Value
Thickener Diameter (Minimum)		m	32.57		2	METS Calculated Value
Upflow Rate		m/h	4.00	-	2	METS Calculated Value
Feed						
Feed Rate Slurry		L/s	925.05		2	METS Calculated Value
	volumetric	m^3/h	3330.17		2	METS Calculated Value
	mass	t/h	3333.14		3	METS Assumption
Feed Rate Solids		L/s	0.43		3	METS Assumption
	volumetric	m^3/h	1.56		2	METS Calculated Value
	mass	t/h	4.13		2	METS Calculated Value
Feed Rate Liquor		L/s	924.61		2	METS Calculated Value
	volumetric	m^3/h	3328.60		2	METS Calculated Value
	mass	t/h	3329.01		2	METS Calculated Value
Residence Time	time	h	0.50		2	METS Calculated Value
Volume		m^3	1667		2	METS Calculated Value
Area		m^2	833		2	METS Calculated Value
% Solids		% w/w	0.12		3	METS Assumption
Density		t/m^3	1.00		3	METS Assumption
Underflow						
Underflow Slurry Rate		L/s	1.36		2	METS Calculated Value
	volumetric	m^3/h	4.89		2	METS Calculated Value
	mass	t/h	7.46		2	METS Calculated Value
Underflow Solids Rate		L/s	0.43		2	METS Calculated Value
	volumetric	m^3/h	1.56		2	METS Calculated Value
	mass	t/h	4.13		2	METS Calculated Value
Underflow Liquor Rate		L/s	0.92		3	METS Assumption
	volumetric	m^3/h	3.33		2	METS Calculated Value
	mass	t/h	3.33		2	METS Calculated Value
Underflow % Solids		% w/w	55.37		2	METS Calculated Value
Underflow Density		t/m^3	1.53		2	METS Calculated Value
Overflow						
Overflow Slurry Rate		L/s	923.69		2	METS Calculated Value
	volumetric	m^3/h	3325.28		2	METS Calculated Value
	mass	t/h	3325.68		2	METS Calculated Value
Overflow Solids Rate		L/s	0.00		2	METS Calculated Value
	volumetric	m^3/h	0.00		2	METS Calculated Value
	mass	t/h	0.00		2	METS Calculated Value
Overflow Liquor Rate		L/s	923.69		2	METS Calculated Value
	volumetric	m^3/h	3325.28		2	METS Calculated Value
	mass	t/h	3325.68		2	METS Calculated Value
Overflow % Solids		% w/w	0.00		2	METS Calculated Value
Overflow Density		t/m^3	1.00		2	METS Calculated Value
Flocculant						
Flocculant Dose Rate	ratio	g/t	100.00		3	METS Assumption
(Unit: gram of flocculant / ton of solid mass)						
Floc Rate		g/h	413.08		2	METS Calculated Value
Flocculant Make-up Concentration		% w/w	0.0025		3	METS Assumption
Sulphuric Acid (200-TK-05/06)						
Sulfuric Acid	ratio	lb/lb of Cu	0.86		3	METS Assumption
		L/s	0.66		2	METS Calculated Value
	volumetric	m^3/h	2.37		2	METS Calculated Value
	mass	t/h	4.34		2	METS Calculated Value
Annual Consumption		t/a	34235		2	METS Calculated Value
Residence Time		h	336		2	METS Calculated Value
Tank Volume		m^3	800.00		2	METS Calculated Value
Ferric Sulphate Silo (200-SI-01)						
Ferric Sulfate	ratio	lb/lb of Cu	1.12		5	Testwork Supplied Data
		L/s	0.51		2	METS Calculated Value
	volumetric	m^3/h	1.83		2	METS Calculated Value
	mass	t/h	5.68		2	METS Calculated Value
Annual Consumption		t/a	44792		2	METS Calculated Value
Residence Time		h	24.00		2	METS Calculated Value
Tank Volume		m^3	44.00		2	METS Calculated Value
Sodium Chloride Silo (200-SI-02)						
Sodium Chloride		L/s	1.15		2	METS Calculated Value
	volumetric	m^3/h	4.14		2	METS Calculated Value
	mass	t/h	4.20		2	METS Calculated Value
Residence Time		h	24.00		2	METS Calculated Value
Tank Volume		m^3	100.00		2	METS Calculated Value
Kerosene Storage Tank (200-TK-08)						
Type			Kerosene or equal		3	METS Assumption
		L/s	924.72		2	METS Calculated Value
	volumetric	m^3/h	2693.17		2	METS Calculated Value
	mass	t/h	3329.01		2	METS Calculated Value
	Residence Time	h	2.00		2	METS Calculated Value
	Volume	m^3	5386		2	METS Calculated Value
Extractant						

Type			M5774 or equal		3	METS Assumption
Delivery Method			IBC		3	METS Assumption
Consumption	mass	t/h	TBD		3	METS Assumption
Flux						
Type			Borax Flux		3	METS Assumption
Delivery Method			Bulka Bags		3	METS Assumption
Consumption	mass	t/h	TBD		3	METS Assumption
Sodium Carbonate Silo (200-SI-03)						
Dosage		g/kg	369.76		3	METS Assumption
Consumption	mass	g/h	298.442		3	METS Assumption
	mass	g/a	2483633		3	METS Assumption

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 300 SILVER PRECIPITATION						
Silver Precipitation Tank (300-TK-01)						
Flow Rate		L/s	924.84		2	METS Calculated Value
	volumetric	m^3/h	3329.42		2	METS Calculated Value
	mass	t/h	3329.88		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Feed Density		t/m^3	1.00		2	METS Calculated Value
Residence Time		h	2.00		3	METS Assumption
Tank Volume		m^3	6658		2	METS Calculated Value
Silver Precipitation						
Silver Chloride (AgCl)	volumetric	L/h	0.03		2	METS Calculated Value
	mass	g/h	144.46		2	METS Calculated Value
Clarifier (300-CF-01)						
Flow Rate		L/s	924.84		2	METS Calculated Value
	volumetric	m^3/h	3329.42		2	METS Calculated Value
	mass	t/h	3329.88		2	METS Calculated Value
		L/s	46.24		2	METS Calculated Value
Overflow Ratio	ratio	%	95%		3	METS Assumption
Overflow		L/s	878.60		2	METS Calculated Value
	volumetric	m^3/h	3162.95		2	METS Calculated Value
	mass	t/h	3163.39		2	METS Calculated Value
Underflow		L/s	46.24		2	METS Calculated Value
	volumetric	m^3/h	166.47		2	METS Calculated Value
	mass	t/h	166.49		2	METS Calculated Value
% Solids Underflow		% w/w	0.00		2	METS Calculated Value
Settling Rate		$m^2/t/h$	0.25	-	3	METS Assumption
% Solids Feed		% w/w	0.00		2	METS Calculated Value
Thickener Cross Sectional Area (Minimum)		m^2	832.47	-	2	METS Calculated Value
Tank Volume		m^3	1665		2	METS Calculated Value
Filter Press Feed Tank (300-TK-02)						
Flow Rate		L/s	46.24		2	METS Calculated Value
To 300-PF-01	volumetric	m^3/h	166.47		2	METS Calculated Value
	mass	t/h	166.49		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.10		3	METS Assumption
Residence Time		h	8.00		3	METS Assumption
Tank Volume		m^3	1332		2	METS Calculated Value
Silver Precipitation Press Filter (300-PF-01)						
Slurry Density		t/m^3	1.00		2	METS Calculated Value
Liquor Density		t/m^3	5.60		2	METS Calculated Value
Solids Density		t/m^3	5.60		2	METS Calculated Value
Filter Feed						
Filter Feed Rate Slurry		L/s	46.24		2	METS Calculated Value
	volumetric	m^3/h	166.47		2	METS Calculated Value
	mass	t/h	166.49		2	METS Calculated Value
Filter Feed Rate Solids		L/s	2.24E-04		2	METS Calculated Value
	volumetric	m^3/h	8.07E-04		2	METS Calculated Value
	mass	t/h	4.52E-03		2	METS Calculated Value
Filter Feed Rate Liquor		L/s	TBC			
	volumetric	m^3/h	TBC			
	mass	t/h	TBC			
Filter Feed % Solids		ppm	0.44		2	METS Calculated Value
Filter Feed Density		t/m^3	1.00		2	METS Calculated Value
Filter Solid Product						
Filter Cake Discharge Rate		L/s	2.24E-04		2	METS Calculated Value
	volumetric	m^3/h	8.07E-04		2	METS Calculated Value
	mass	t/h	4.52E-03		2	METS Calculated Value
	mass (kg/h)	kg/h	4.520		2	METS Calculated Value
Filter Cake Discharge Rate Liquor		L/s	0.00		2	METS Calculated Value
	volumetric	m^3/h	0.00		2	METS Calculated Value
	mass	t/h	0.00		2	METS Calculated Value
Filter Cake Discharge Rate Solids		L/s	2.24E-04		2	METS Calculated Value
	volumetric	m^3/h	8.07E-04		2	METS Calculated Value
	mass	t/h	4.52E-03		2	METS Calculated Value
Filter Cake Discharge % Solids		% w/w	100.00		3	METS Assumption
Filter Cake Solid Discharge Density		t/m^3	5.60		2	METS Calculated Value
Filter Liquor Product						
Filtrate Discharge Rate		L/s	46.24		2	METS Calculated Value
	volumetric	m^3/h	166.47		2	METS Calculated Value
	mass	t/h	166.49		2	METS Calculated Value
Filtrate Discharge Rate Liquor		L/s	46.24		2	METS Calculated Value

	volumetric	m^3/h	166.47		2	METS Calculated Value	
	mass	t/h	166.49		2	METS Calculated Value	
Filtrate Discharge Rate Solids		L/s	0.00		2	METS Calculated Value	
	volumetric	m^3/h	0.00		2	METS Calculated Value	
	mass	t/h	0.00		2	METS Calculated Value	
Filtrate Discharge % Solids		% w/w	0.00		2	METS Calculated Value	
Filtrate Discharge Density		t/m^3	1.00		2	METS Calculated Value	
Filter Press Filtrate Tank (300-TK-03)							
Flow Rate		L/s	924.84		2	METS Calculated Value	
	volumetric	m^3/h	3329.42		2	METS Calculated Value	
	mass	t/h	3329.88		2	METS Calculated Value	
Feed Streams In							
Filtrate 300-PF-01		L/s	46.24		2	METS Calculated Value	
	volumetric	m^3/h	166.47		2	METS Calculated Value	
	mass	t/h	166.49		2	METS Calculated Value	
Clarifier 300-CF-01 Overflow		L/s	878.60		2	METS Calculated Value	
	volumetric	m^3/h	3162.95		2	METS Calculated Value	
	mass	t/h	3163.39		2	METS Calculated Value	
% Solids		% w/w	0.00		2	METS Calculated Value	
Density		t/m^3	1.00		2	METS Calculated Value	
Residence Time		h	2.00		3	METS Assumption	
Tank Volume		m^3	6658.00		2	METS Calculated Value	
Silver Precipitation Sand Filter (300-SF-01/02)							
Flow Rate		L/s	924.84		2	METS Calculated Value	
	volumetric	m^3/h	3329.42		2	METS Calculated Value	
% Solids		% w/w	0.00		2	METS Calculated Value	
Density		t/m^3	1.00		2	METS Calculated Value	
Residence Time		h	0.10		3	METS Assumption	
Tank Volume		m^3	332.00		2	METS Calculated Value	
Clarifier Feed Tank (300-TK-04)							
Flow Rate		L/s	924.84		2	METS Calculated Value	
	volumetric	m^3/h	3329.42		2	METS Calculated Value	
% Solids		% w/w	0.00		2	METS Calculated Value	
Density		t/m^3	1.00		2	METS Calculated Value	
Residence Time		h	2.00		3	METS Assumption	
Tank Volume		m^3	6658.00		2	METS Calculated Value	
Clarifier (300-CF-02)							
Flow Rate		L/s	924.84		2	METS Calculated Value	
	volumetric	m^3/h			2	METS Calculated Value	
Settling Rate		$m^2/t/h$	0.25	-	3	METS Assumption	
Thickener Cross Sectional Area (Minimum)		m^2	832.47	-	2	METS Calculated Value	
Volume		m^3	1664.94		2	METS Calculated Value	
Smelting Furnace (300-FU-01)							
AgCl Feed		kg/h	4.520		2	METS Calculated Value	
Operation			Batch		3	METS Assumption	
Furnace Size			TBD		3	METS Assumption	
Silver Production		kg/h	3.402		2	METS Calculated Value	

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 400 SOLVENT EXTRACTION						
Organic Feed Tank (400-TK-01)						
Flow Rate		L/s	924.72		2	METS Calculated Value
Organic Extractant and Diluent	volumetric	m^3/h	2693.17		2	METS Calculated Value
	mass	t/h	3329.01		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	0.81		2	METS Calculated Value
Residence Time		h	3.00		3	METS Assumption
		m^3	8080.00		2	METS Calculated Value
Copper Extraction Mixer Settler (400-SX-01/02)						
Number of Cells		#	20		3	METS Assumption
Volume/Cell Minimum (Mixer)		m^3	2.31		2	METS Calculated Value
Volume/Cell Minimum (Settler)		m^3	12.33		2	METS Calculated Value
Residence Time (Mixer)		min	1.50		3	METS Assumption
Residence Time (Settler)		min	8.00		3	METS Assumption
Mixer Diameter		TBD	TBD		3	METS Assumption
Mixer Height		TBD	TBD		3	METS Assumption
Settler Width		TBD	TBD		3	METS Assumption
Settler Area Settler Length		TBD	TBD		3	METS Assumption
Temperature		°C	Ambient		3	METS Assumption
SX O:A Ratio		O:A	0.81		2	METS Calculated Value
SX Feed Flow		L/s	1849.56		2	METS Calculated Value
Total Feed	volumetric	m^3/h	6658.42		2	METS Calculated Value
	mass	t/h	6023.04		2	METS Calculated Value
Feed Streams In						
PLS Feed		L/s	924.84		2	METS Calculated Value
	volumetric	m^3/h	3329.42		2	METS Calculated Value
	mass	t/h	3329.88		2	METS Calculated Value
Organic Feed Rate		L/s	924.72		2	METS Calculated Value
	volumetric	m^3/h	3329.01		2	METS Calculated Value
	mass	t/h	2693.17		2	METS Calculated Value
SX Exit Flow		L/s	1864.25		2	METS Calculated Value
Total Exit	volumetric	m^3/h	6711.32		2	METS Calculated Value
	mass	t/h	6076.65		2	METS Calculated Value
Exit Streams Out						
Raffinate Exit Flow		L/s	923.42		2	METS Calculated Value
To Raffinate Pond 200-PO-05	volumetric	m^3/h	3324.30		2	METS Calculated Value
	mass	t/h	3325.01		2	METS Calculated Value
Loaded Orgranic to Stripping Circuit		L/s	925.95		2	METS Calculated Value
To Stripping Circuit 400-ST-01/02	volumetric	m^3/h	3333.41		2	METS Calculated Value
	mass	t/h	2698.03		2	METS Calculated Value
Acid Loss		L/s	14.89		2	METS Calculated Value
	volumetric	m^3/h	53.61		2	METS Calculated Value
	mass	t/h	53.61		2	METS Calculated Value
Aqueous Parameters						
pH Initial		pH	1.50		3	METS Assumption
Organic Parameters						
Organic Loss Rate		%	0.001%		3	METS Assumption
		m^3/h	0.0333		3	METS Assumption
Loaded Organic Discharge Rate		m^3/h	3333.41		2	METS Calculated Value
Organic in Diluent		%	15%		3	METS Assumption
Copper Stripping Circuit (400-ST-01/02)						
Number of Cells		#	20.00		3	METS Assumption
Volume/Cell Minimum (Mixer)		m^3	5.02		2	METS Calculated Value
Volume/Cell Minimum (Settler)		m^3	26.78		2	METS Calculated Value
Residence Time (Mixer)		min	1.50		3	METS Assumption
Residence Time (Settler)		min	8.00		3	METS Assumption
Temperature		°C	Ambient		3	METS Assumption
Stripping Efficiency		%	100.00		3	METS Assumption
ST O/A Ratio		O:A	4.87		2	METS Calculated Value
ST Feed Flow		L/s	1115.98		2	METS Calculated Value
Total Feed	volumetric	m^3/h	4017.54		2	METS Calculated Value
	mass	t/h	3397.26		2	METS Calculated Value
Feed Streams In						
Loaded Organic Feed Rate		L/s	925.95		2	METS Calculated Value
From Extraction Circuit 400-SX-01/02	volumetric	m^3/h	3333.41		2	METS Calculated Value
	mass	t/h	2698.03		2	METS Calculated Value
Stripping Solution Feed		L/s	190.04		2	METS Calculated Value
From EW 500-EW-01/02	volumetric	m^3/h	684.13		2	METS Calculated Value
	mass	t/h	699.23		2	METS Calculated Value
ST Exit Flow		L/s	1114.04		2	METS Calculated Value
Total Exit	volumetric	m^3/h	4010.54		2	METS Calculated Value
	mass	t/h	3397.26		2	METS Calculated Value
Exit Streams Out						
Electrolyte		L/s	190.20		2	METS Calculated Value

To Electrowinning Feed Tank 200-TK-04	volumetric	m^3/h	684.72		2	METS Calculated Value
	mass	t/h	704.26		2	METS Calculated Value
Diluent Recycle		L/s	923.84		2	METS Calculated Value
	volumetric	m^3/h	3325.82		2	METS Calculated Value
	mass	t/h	2693.01		2	METS Calculated Value
Aqueous Parameters						
Stripping Solution Feed Rate		m^3/h	684.13		2	METS Calculated Value
Aqueous Discharge Rate		m^3/h	684.72		2	METS Calculated Value
Organic Parameters						
Loaded Organic Feed Rate		m^3/h	3333.41		2	METS Calculated Value
Organic Discharge Rate		m^3/h	3325.82		2	METS Calculated Value

Cobre Limited - Kalahari Copper Belt Botswana Project

Description		Units	Nominal	Design	Code	Source
AREA 500 ELECTROWINNING & CRYSTALLISATION						
Electrowinning (500-EW-01/02)						
Number of Cells		#	14		2	METS Calculated Value
Electrowin Time		days	TBD	-	3	METS Assumption
Cell Volume		m^3	TBD	-	3	METS Assumption
Flowrate	(per cell)	m^3/h	50	-	2	METS Calculated Value
Feed Flow Rate	(per cell)	L/s	14	-	2	METS Calculated Value
Cell Feed Copper Concentration		g/L	40	-	3	METS Assumption
Electrowinning Copper Recovery		%	99.00%	-	3	METS Assumption
Copper Production		t/h	5.17		2	METS Calculated Value
		tonnes/annum	43,030	-	3	METS Assumption
		Mlb/a	95	-	3	METS Assumption
Cell Voltage		V	2		3	METS Assumption
Cathode Material		-	SS Blank Cathodes	-	4	Specification
Cathode Cleaning		-	High Pressure Water	-	4	Specification
Cathode Cleaning Frequency		per week	1	-	3	METS Assumption
Water Requirement for Cathode Cleaning		m^3/clean	15	-	3	METS Assumption
Electrowinning Efficiency		%	100	-	3	METS Assumption
Temperature		°C	50-60		3	METS Assumption
EW Feed		L/s	190.20		2	METS Calculated Value
Electrolyte	volumetric	m^3/h	684.72		2	METS Calculated Value
	mass	t/h	704.26		2	METS Calculated Value
EW Products		L/s	190.20		2	METS Calculated Value
	volumetric	m^3/h	684.70		2	METS Calculated Value
	mass	t/h	704.40		2	METS Calculated Value
Exit Streams Out						
To Stripping Circuit 400-ST-01/02		L/s	190.04		2	METS Calculated Value
	volumetric	m^3/h	684.13		2	METS Calculated Value
	mass	t/h	699.23		2	METS Calculated Value
Copper Cathode		L/s	0.16		2	METS Calculated Value
	volumetric	m^3/h	0.58		2	METS Calculated Value
	mass	t/h	5.17		2	METS Calculated Value
Crystallisation Feed Tank (500-TK-01)						
Operation Mode			Alternative			
Ratio of SX Eluate to Crystallisation		%	40%		3	METS Assumption
Feed Rate of SX Eluate to Crystalliser		m^3/h	273.89	-	2	METS Calculated Value
Residence Time of Crystalliser Feed Tank		hours	2.0	-	3	METS Assumption
Crystallisier Feed Tank Volume		m^3	547.8	-	3	METS Assumption
Flow Rate		L/s	76.08		2	METS Calculated Value
To 500-CR-01 Crystalliser	volumetric	m^3/h	273.89		2	METS Calculated Value
	mass	t/h	281.70		2	METS Calculated Value
% Solids		% w/w	0.00		2	METS Calculated Value
Density		t/m^3	1.03		2	METS Calculated Value
Residence Time		h	3.00		3	METS Assumption
Tank Volume		m^3	821.66		2	METS Calculated Value
		L/s	547.77		2	METS Calculated Value
Crystalliser (500-CR-01)						
Crystalliser Feed		L/s	76.08		2	METS Calculated Value
	volumetric	m^3/h	273.89		2	METS Calculated Value
	mass	t/h	281.70		2	METS Calculated Value
Crystalliser Design						
Crystalliser Type			Forced Circulation		3	METS Assumption
pH control			pH 2 to 4		3	METS Assumption
Operating Temperature		K	TBD		3	METS Assumption
Residence Time		h	0.50		3	METS Assumption
Crystalliser Volume		m^3	136.94		2	METS Calculated Value
Copper Sulphate Centrifuge (500-CF-01)						
Feed Rate		L/s	76		2	METS Calculated Value
Cu Concentration		g/L	40		2	METS Calculated Value
Copper Feed Rate		kg/h	10,955		2	METS Calculated Value
Cu to Copper Sulphate			4		2	METS Calculated Value
Feed Rate of SX Eluate to Crystalliser		kg/h	43,046	-	2	METS Calculated Value
Flash Dryer (500-FD-01)						
Feed Rate		kg/h	43,046	-	2	METS Calculated Value

APPENDIX D – Mass Balance

Appendix items

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DOCUMENT COVER SHEET

CLIENT:	Cobre Limited
PROJECT TITLE:	Ngami Copper Project
PROJECT NO.:	J5945
DOCUMENT TITLE:	Solution Mining Model
DOCUMENT NO:	J5945-P-MB-100-001

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.			
CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH
	NAME	DATE	
OR			
CH			

Rev	Date	Revision	By	Ch'k	Appv.
3	14/10/24	Issued for Information	MN	JB	DC
2	25/09/24	Issued for Client Review	MN	JB	DC
1	23/09/24	Issued for Client Review	MN	JB	DC
0	6/09/24	Issued for Client Review	MN	JB	DC
C	2/09/24	Issued for Internal Review	MN	JB	DC
B	26/08/24	Issued for Internal Review	MN	EA	DC
A	21/08/24	Issued for Internal Review	MN	JB	DC

Physical Parameters

Depth of Cover (sand)	30	m
Depth of Cover (calcrete)	40	m
Depth of Cover (sand & calcrete)	70	m
Orebody width	5	m
Orebody strike length	500	m
Orebody Depth	190	m
Orebody density	2.77	t/m^3
Orebody volume	475000	m^3
Orebody tonnes	1,315,750.00	t
Copper Grade	0.4	%
Silver Grade	7	g/t
Contained Copper	5263	t
Contained Silver	9210.25	kg
Drill Depth	260	m
Field Area	2500	m^2
Field Volume	475000	m^3
Well Spacing	100	m
Injection/Extraction Pairing	500	m^2
Number of Wells	5	wells
Injection Rate per well	3	L/s
Total Injection Rate	15	L/s
Efficiency	100	%
Total Extraction Rate	15	L/s
	54	m^3/h
Copper Recovery	40	%
Silver Recovery	20	%
Fracture Porosity	20%	%
Fracture Volume	95000	m^3
Maximum Injection Rate	54	m^3/h
Maximum Extraction Rate	54	m^3/h
Residence time	1759.26	h
	73.30	days
Recoverable Copper	2105.20	t
Recoverable Silver	1842.05	kg
Target PLS	1.50	g/L Cu
Calculated PLS tenor	1.58	g/L Cu
	1.39	ppm Ag

Revenue

Copper price AUD	$	14,594.58	AU$/t
	$	6.62	AU$/lb
Silver price AUD	$	1,629,658.80	AU$/t
	$	46.20	AU$/oz
Copper	$	30,724,519.08	AU$
Silver	$	3,001,912.99	AU$
Total Revenue	$	33,726,432.07	AU$
Contribution Cu		91.1%	
Contribution Ag		8.9%	

ISCR Wellfield Costs
Capital
Drilling Costs

Cost per Production Well	$	111,671.00	US$	260 m	Client supplied September 2024	
Drilling Costs per metre	$	429.50	$/m			
Monitoring Well Cost		$60,683	$/m		Client supplied September 2024	
Monitoring well spacing		200	m		WSP Advised well field arrangement	
Number of monitoring wells		3				
Drilling Cost per well	$	740,404.00	USD		1.54	USD:AUD
	$	1,140,222.16	AUD			

Pump Costs

Well Production Pumps	$	12,681.80	@3L/s	10.8 m^3/h	63,409	Global pumps	2023	54 m^3/h
Total Pump Cost	$	63,409.00	AUD					
Mechanical Costs	$	1,203,631.16						

Wellfield Infrastructure Costs

Mechanical Costs		61%	of mechanical costs	Earthworks	5%
	$	734,215.01	AUD	Concrete	2%
				Structural Steel	10%
				Mechanical	35%
Civil Costs		19%	of mechanical costs	Pipework	10%
	$	228,689.92	AUD	Electrical	7%
				Roads	2%
Total Capital Cost	**$**	**2,166,536.09**	AUD	Freight	9%
					80%

Operating Cost

Avaliable Hours		8760	h				
Wellfield Avaliability		90%	%				
Wellfield Operating Hours		7884	h				
Utilisation		100%	%				
Single Pump Power		11	kW	10.8 m^3/h	55 kW	Global pumps	54 m^3/h
Total Pump Power		55.00	kW				
Total Wellfield Power Consumption		433,620	kWh				
Conversion		0.4	L/kWh		$ 1.20	USD	
Diesel		1.84	$/L		$ 1.84	AUD	
Power Cost	$	0.74	AUD/kWh				
Fuel Cost	$	319,144.32	AUD				
Maintenance Cost		5%	% of capital cost				
	$	108,326.80	AUD				
Parts and Consumables Costs		10%	% of capital cost				
	$	216,653.61	AUD				
Total Operating Cost	**$**	**644,124.73**	AUD				

Wellfield Summary

Revenue	$	33,726,432.07
Capital Cost	$	2,166,536.09
Operating Cost	$	644,124.73
Wellfield Margin	**$**	**30,915,771.25**

Model Assumptions

Well spacing assumed to be 100 m based on WSP recommendation. Current strike length 500 m.
Orebody depth is an input. Initial assumption based on input from client and WSP that drill depth is 260m. Assumption of 190m depth orebody
Assumes no evaporation - evap will increase solution tenor
Model curently does not take into account inflows of groundwater or attempts to increase the groundwater level
Model assumes inline injection and extraction well arrangement running along strike based on WSP recommendation.
Assumed fracture porosity affects volumetric flow capacity not leachable ore. Leachable ore controlled by recovery.

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DOCUMENT COVER SHEET

CLIENT: Cobre Limited

PROJECT TITLE: Ngami Copper Project

PROJECT NO.: J5945

DOCUMENT TITLE: Cobre Process Flowsheet Mass Balance Stage 1

DOCUMENT NO: J5945 - P - MB - 0001

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.			
CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH
	NAME	DATE	
OR			
CH			

Rev	Date	Revision	By	Ch'k	Appv.
1	14/10/24	Issued for Information	EA	MN	DC
0	27/09/24	Issued for Client Review	EA	MN	DC
D	24/09/24	Issued for Internal Review	EA	MN	DC
C	17/09/24	Issued for Internal Review	EA	MN	DC
B	12/09/24	Issued for Internal Review	EA	MN	DC
A	9/09/23	Issued for Internal Review	EA	JB	DC

Area Tag			Area 100: In-Situ Copper Recovery				
Stream - Tag			P_018	P_019	P_020	P_021	P_022
Properties		Unit	Rafinate_Pond/Purge Output to 200-TK-01 Input	Sulphuric_Acid to 200-TK-01 Input	Ferric_Sulphate to 200-TK-01 Input	ProcessWaterAddition to 200-TK-01 Input	200-TK-01 Output to Insitu_Leaching Input
Mass Flow	Total	t/h	132.7	0.2	0.3	24.9	158.1
	Liquid	t/h	132.7	0.2	0.3	24.9	158.1
	Solids	t/h	-	-	-	-	-
Volume Flow	Total @T	m3/h	132.8	0.1	0.1	25.0	157.9
	Liquid @T	m3/h	132.8	0.1	0.1	25.0	157.9
	Solids @T	m3/h	-	-	-	-	-
Percent solids	% Solids	wt%	-	-	-	-	-
Density	Density @T	t/m³	1.0	1.8	3.1	1.0	1.0
Water	Water	t/h	132.1	0.0	-	24.9	157.0
Elemental Flows	Cu	kg/h	0.6	-	-	-	0.6
	Ag	kg/h	0.0	-	-	-	0.0
	Fe	kg/h	70.6	-	75.5	-	146.1
Liquid Composition	Cu	g/L	0.0	-	-	-	0.0
	Ag	ppm	0.00014	-	-	-	0.00011
	Fe	g/L	0.5	-	865.0	-	0.9
Solid Fraction	Cu	%	-	-	-	-	-
	Ag	%	-	-	-	-	-
	Fe	%	-	-	-	-	-

Area Tag							
Stream - Tag			P_023	P_024	GasFromAtmosphericPond	OreVein	OreVeinUnleached
Properties		Unit	Insitu_Leaching Output to 200-PO-01 Input	O2_Dosing to Insitu_Leaching Input	200-PO-01 Output to Pond_Gas_Purge	ORE_FEED to Insitu_Leaching Input	Insitu_Leaching Output to ORE_UNLEACHED
Mass Flow	Total	t/h	159.5	1.0	1.0	45.0	44.4
	Liquid	t/h	158.4	0.0	-	0.0	-
	Solids	t/h	0.2	-	-	45.0	44.4
Volume Flow	Total @T	m3/h	900.6	764.6	742.1	16.9	16.8
	Liquid @T	m3/h	158.4	0.0	-	0.0	-
	Solids @T	m3/h	0.1	-	-	16.9	16.8
Percent solids	% Solids	wt%	0.1	-	-	100.0	100.0
Density	Density @T	t/m³	0.2	0.0	0.0	2.7	2.6
Water	Water	t/h	157.3	-	-	-	-
Elemental Flows	Cu	kg/h	242.0	-	-	853.8	517.4
	Ag	kg/h	0.2	-	-	1.4	1.1
	Fe	kg/h	128.4	-	-	-	-
Liquid Composition	Cu	g/L	1.5	-	-	-	-
	Ag	ppm	0.00114	-	-	-	-
	Fe	g/L	0.8	-	-	-	-
Solid Fraction	Cu	%	1.2	-	-	1.9	1.2
	Ag	%	0.0027	-	-	0.0032	0.0026
	Fe	%	-	-	-	-	-

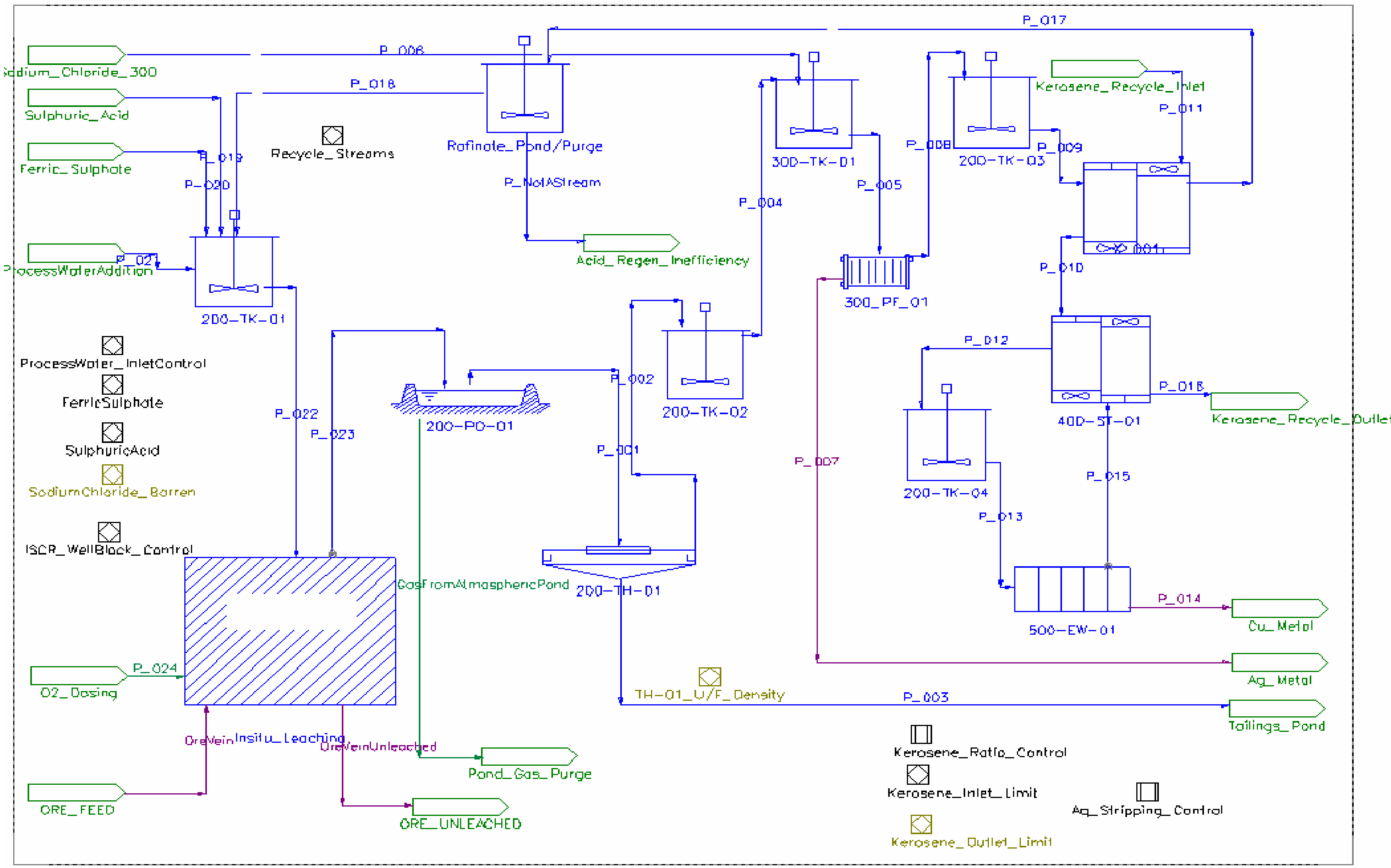
Area Tag			Area 200				Area 300: Silver Percipitation	
Stream - Tag			P_001	P_002	P_003	P_004	P_005	P_006
Properties		Unit	200-PO-01 Output to 200-TH-01 Input	200-TH-01 Output to 200-TK-02 Input	200-TH-01 Output to Tailings_Pond	200-TK-02 Output to 300-TK-01 Input	300-TK-01 Output to 300_PF_01 Input	Sodium_Chloride_300 to 300-TK-01 Input
Mass Flow	Total	t/h	158.6	158.2	0.4	158.2	158.4	0.2
	Liquid	t/h	158.4	158.2	0.2	158.2	158.4	0.2
	Solids	t/h	0.2	-	0.2	-	0.0	-
Volume Flow	Total @T	m3/h	158.4	158.2	0.2	158.2	158.4	0.2
	Liquid @T	m3/h	158.4	158.2	0.2	158.2	158.4	0.2
	Solids @T	m3/h	0.1	-	0.1	-	0.0	-
Percent solids	% Solids	wt%	0.1	-	55.4	-	0.0	-
Density	Density @T	t/m³	1.0	1.0	1.5	1.0	1.0	1.0
Water	Water	t/h	157.3	157.1	0.2	157.1	157.3	0.2
Elemental Flows	Cu	kg/h	242.0	239.3	2.7	239.3	239.3	-
	Ag	kg/h	0.2	0.2	0.0	0.2	0.2	-
	Fe	kg/h	128.4	128.3	0.1	128.3	128.3	-
Liquid Composition	Cu	g/L	1.5	1.5	1.5	1.5	1.5	-
	Ag	ppm	0.00114	0.00114	0.00114	0.00114	0.00011	-
	Fe	g/L	0.8	0.8	0.8	0.8	0.8	-
Solid Fraction	Cu	%	1.2	-	1.2	-	-	-
	Ag	%	0.0027	-	0.0027	-	75.3	-
	Fe	%	-	-	-	-	-	-

Area Tag							Area 400: Solvent Extraction	
Stream - Tag			P_007	P_008	P_009	P_010	P_011	P_012
Properties		Unit	300_PF_01 Output to Ag_Metal	300_PF_01 Output to 200-TK-03 Input	200-TK-03 Output to X_001	X_001 to 400-ST-01 Input	Kerosene_Recycle_Inlet to X_001	400-ST-01 Output to 200-TK-04 Input
Mass Flow	Total	t/h	0.0	158.4	158.4	128.4	128.1	33.5
	Liquid	t/h	-	158.4	158.4	128.4	128.1	33.5
	Solids	t/h	0.0	-	-	-	-	-
Volume Flow	Total @T	m3/h	0.0	158.4	158.4	158.6	158.4	32.6
	Liquid @T	m3/h	-	158.4	158.4	158.6	158.4	32.6
	Solids @T	m3/h	0.0	-	-	-	-	-
Percent solids	% Solids	wt%	100.0	-	-	-	-	-
Density	Density @T	t/m³	5.6	1.0	1.0	0.8	0.8	1.0
Water	Water	t/h	-	157.3	157.3	-	-	32.3
Elemental Flows	Cu	kg/h	-	239.3	239.3	238.7	-	1,173.7
	Ag	kg/h	0.2	0.0	0.0	-	-	-
	Fe	kg/h	-	128.3	128.3	-	-	-
Liquid Composition	Cu	g/L	-	1.5	1.5	1.5	-	36.0
	Ag	ppm	-	0.00011	0.00011	-	-	-
	Fe	g/L	-	0.8	0.8	-	-	-
Solid Fraction	Cu	%	-	-	-	-	-	-
	Ag	%	75.3	-	-	-	-	-
	Fe	%	-	-	-	-	-	-

Area Tag						Area 500: Electrowinning	
Stream - Tag			P_013	P_014	P_016	P_015	P_017
Properties		Unit	200-TK-04 Output to 500-EW-01 Input	500-EW-01 Output to Cu_Metal	400-ST-01 Output to Kerosene_Recycle_Outlet	500-EW-01 Output to 400-ST-01 Input	X_001 to Rafinate_Pond/Purge Input
Mass Flow	Total	t/h	33.5	0.2	128.1	33.3	158.2
	Liquid	t/h	33.5	-	128.1	33.3	158.2
	Solids	t/h	-	0.2	-	-	-
Volume Flow	Total @T	m3/h	32.6	0.0	158.2	32.5	158.2
	Liquid @T	m3/h	32.6	-	158.2	32.5	158.2
	Solids @T	m3/h	-	0.0	-	-	-
Percent solids	% Solids	wt%	-	100.0	-	-	-
Density	Density @T	t/m³	1.0	9.0	0.8	1.0	1.0
Water	Water	t/h	32.3	-	-	32.3	157.3
Elemental Flows	Cu	kg/h	1,173.7	246.0	-	935.0	0.6
	Ag	kg/h	-	-	-	-	0.0
	Fe	kg/h	-	-	-	-	128.3
Liquid Composition	Cu	g/L	36.0	-	-	28.7	0.0
	Ag	ppm	-	-	-	-	0.00011
	Fe	g/L	-	-	-	-	0.8
Solid Fraction	Cu	%	-	100.0	-	-	-
	Ag	%	-	-	-	-	-
	Fe	%	-	-	-	-	-

METS assumptions and calculations

ITEM	Value	Source	Comments
Area 200: ISCR			
Copper Recovery	40%	METS	
Copper Concentration	1.5 g/l	METS	Taken from ISCR concentration calculations
ISCR Solids Pull	5%	METS	5% of solids are brought up from ISCR wells
ISCR Acid Losses	9%	METS	9% of acid lost through ISCR Voids
Thickener U/F Solids %	40%	METS	
Area 300: Silver Percipitation			
Silver Precipitation Recovery	90%	METS	
Filter Press Efficiency	98%	METS	
Area 400: Solvent Extraction			
Stripping Recovery	95%	METS	
Extraction Ratio	99%	METS	
Organic:Inlet Aq Ratio	1 to 1	METS	Organics in Stripping double Cu g/l
Organic:Outlet Aq Ratui	5 to 1	METS	Used to aim for 40 g/l in electrowinning
Acid Regeneration Efficiency	84%	METS	16% of acid not recovered through SX
Area 500: Electrowinning			
EW Efficiency	99%	METS	



Sodium_Chloride_300
Sulphuric_Acid
Ferric_Sulphate
ProcessWaterAddition
P_006
P_018
P_019
P_020
P_021
Recycle_Streams
Rafinate_Pond/Purge
P_NotAStream
Acid_Regen_Inefficiency
200-TK-01
ProcessWater_InletControl
FerricSulphate
SulphuricAcid
SodiumChloride_Barren
ISCR_WellBlock_Control
P_022
P_023
200-PD-01
P_002
P_001
200-TK-02
P_004
300-TK-01
P_005
300_PF_01
P_008
200-TK-03
P_009
P_017
Kerosene_Recycle_Inlet
P_011
P_010
P_012
400-ST-01
P_016
Kerosene_Recycle_Outlet
P_007
200-TK-04
P_013
P_015
500-EW-01
P_014
Cu_Metal
Ag_Metal
GasFromAtmosphericPond
200-TH-01
TH-01_U/F_Density
P_003
Tailings_Pond
P_024
O2_Dosing
OreVein
Insitu_Leaching
OreVeinUnleached
Pond_Gas_Purge
ORE_FEED
ORE_UNLEACHED
Kerosene_Ratio_Control
Kerosene_Inlet_Limit
Aq_Stripping_Control
Kerosene_Outlet_Limit

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DOCUMENT COVER SHEET

CLIENT: Cobre Limited

PROJECT TITLE: Ngami Copper Project

PROJECT NO.: J5945

DOCUMENT TITLE: Cobre Process Flowsheet Mass Balance Stage 2

DOCUMENT NO: J5945 - P - MB - 0002

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.		
CHECKING METHOD		CHECKING LEVEL
WORK INSTRUCTION / CHECKLIST NO.	OR	CH
NAME		DATE
OR		
CH		

Rev	Date	Revision	By	Ch'k	Appv.
1	14/10/24	Issued for Information	EA	MN	DC
0	27/09/24	Issued for Client Review	EA	MN	DC
D	24/09/24	Issued for Internal Review	EA	MN	DC
C	17/09/24	Issued for Internal Review	EA	MN	DC
B	12/09/24	Issued for Internal Review	EA	MN	DC
A	9/09/23	Issued for Internal Review	EA	JB	DC

Area Tag			Area 100: In-Situ Copper Recovery				
Stream - Tag			P_018	P_019	P_020	P_021	P_022
Properties		Unit	Rafinate_Pond/Purge Output to 200-TK-01 Input	Sulphuric_Acid to 200-TK-01 Input	Ferric_Sulphate to 200-TK-01 Input	ProcessWaterAddition to 200-TK-01 Input	200-TK-01 Output to Insitu_Leaching Input
Mass Flow	Total	t/h	2,788.8	4.3	5.7	523.2	3,322.1
	Liquid	t/h	2,788.8	4.3	5.7	523.2	3,322.1
	Solids	t/h	-	-	-	-	-
Volume Flow	Total @T	m3/h	2,791.2	2.4	1.8	524.8	3,319.6
	Liquid @T	m3/h	2,791.2	2.4	1.8	524.8	3,319.6
	Solids @T	m3/h	-	-	-	-	-
Percent solids	% Solids	wt%	-	-	-	-	-
Density	Density @T	t/m³	1.0	1.8	3.1	1.0	1.0
Water	Water	t/h	2,777.7	0.1	-	523.2	3,301.0
Elemental Flows	Cu	kg/h	12.6	-	-	-	12.6
	Ag	kg/h	0.4	-	-	-	0.4
	Fe	kg/h	1,483.3	-	1,586.9	-	3,070.2
Liquid Composition	Cu	g/L	0.0	-	-	-	0.0
	Ag	ppm	0.00014	-	-	-	0.00011
	Fe	g/L	0.5	-	865.0	-	0.9
Solid Fraction	Cu	%	-	-	-	-	-
	Ag	%	-	-	-	-	-
	Fe	%	-	-	-	-	-

Area Tag							
Stream - Tag			P_023	P_024	GasFromAtmosphericPond	OreVein	OreVeinUnleached
Properties		Unit	Insitu_Leaching Output to 200-PO-01 Input	O2_Dosing to Insitu_Leaching Input	200-PO-01 Output to Pond_Gas_Purge	ORE_FEED to Insitu_Leaching Input	Insitu_Leaching Output to ORE_UNLEACHED
Mass Flow	Total	t/h	3,353.2	21.0	20.1	945.9	932.6
	Liquid	t/h	3,329.0	0.0	-	0.0	-
	Solids	t/h	4.1	-	-	945.9	932.6
Volume Flow	Total @T	m3/h	18,929.0	16,070.6	15,598.8	355.8	352.4
	Liquid @T	m3/h	3,328.6	0.0	-	0.0	-
	Solids @T	m3/h	1.6	-	-	355.8	352.4
Percent solids	% Solids	wt%	0.1	-	-	100.0	100.0
Density	Density @T	t/m³	0.2	0.0	0.0	2.7	2.6
Water	Water	t/h	3,306.0	-	-	-	-
Elemental Flows	Cu	kg/h	5,085.9	-	-	17,946.2	10,875.0
	Ag	kg/h	3.9	-	-	30.2	24.0
	Fe	kg/h	2,699.6	-	-	-	-
Liquid Composition	Cu	g/L	1.5	-	-	-	-
	Ag	ppm	0.00114	-	-	-	-
	Fe	g/L	0.8	-	-	-	-
Solid Fraction	Cu	%	1.2	-	-	1.9	1.2
	Ag	%	0.0027	-	-	0.0032	0.0026
	Fe	%	-	-	-	-	-

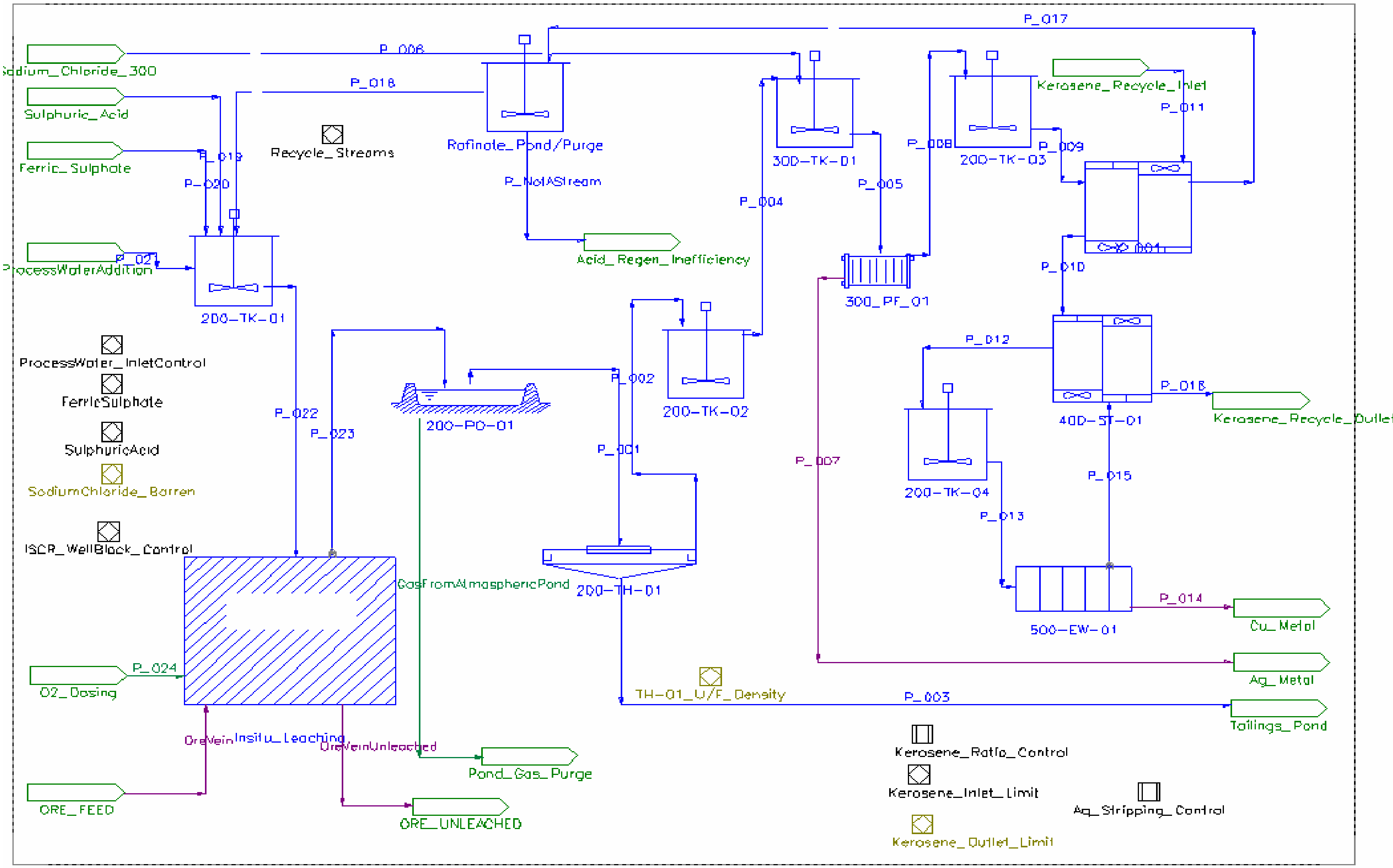
Area Tag			Area 200				Area 300: Silver Percipitation	
Stream - Tag			P_001	P_002	P_003	P_004	P_005	P_006
Properties		Unit	200-PO-01 Output to 200-TH-01 Input	200-TH-01 Output to 200-TK-02 Input	200-TH-01 Output to Tailings_Pond	200-TK-02 Output to 300-TK-01 Input	300-TK-01 Output to 300_PF_01 Input	Sodium_Chloride_300 to 300-TK-01 Input
Mass Flow	Total	t/h	3,333.1	3,325.7	7.5	3,325.7	3,329.9	4.2
	Liquid	t/h	3,329.0	3,325.7	3.3	3,325.7	3,329.9	4.2
	Solids	t/h	4.1	-	4.1	-	0.0	-
Volume Flow	Total @T	m3/h	3,330.2	3,325.3	4.9	3,325.3	3,329.4	4.1
	Liquid @T	m3/h	3,328.6	3,325.3	3.3	3,325.3	3,329.4	4.1
	Solids @T	m3/h	1.6	-	1.6	-	0.0	-
Percent solids	% Solids	wt%	0.1	-	55.4	-	0.0	-
Density	Density @T	t/m³	1.0	1.0	1.5	1.0	1.0	1.0
Water	Water	t/h	3,306.0	3,302.7	3.3	3,302.7	3,306.7	4.0
Elemental Flows	Cu	kg/h	5,085.9	5,029.6	56.2	5,029.6	5,029.6	-
	Ag	kg/h	3.9	3.8	0.1	3.8	3.8	-
	Fe	kg/h	2,699.6	2,696.9	2.7	2,696.9	2,696.9	-
Liquid Composition	Cu	g/L	1.5	1.5	1.5	1.5	1.5	-
	Ag	ppm	0.00114	0.00114	0.00114	0.00114	0.00011	-
	Fe	g/L	0.8	0.8	0.8	0.8	0.8	-
Solid Fraction	Cu	%	1.2	-	1.2	-	-	-
	Ag	%	0.0027	-	0.0027	-	75.3	-
	Fe	%	-	-	-	-	-	-

Area Tag					Area 400: Solvent Extraction			
Stream - Tag			P_007	P_008	P_009	P_010	P_011	P_012
Properties		Unit	300_PF_01 Output to Ag_Metal	300_PF_01 Output to 200-TK-03 Input	200-TK-03 Output to X_001	X_001 to 400-ST-01 Input	Kerosene_Recycle_Inlet to X_001	400-ST-01 Output to 200-TK-04 Input
Mass Flow	Total	t/h	0.0	3,329.9	3,329.9	2,698.0	2,693.2	704.3
	Liquid	t/h	-	3,329.9	3,329.9	2,698.0	2,693.2	704.3
	Solids	t/h	0.0	-	-	-	-	-
Volume Flow	Total @T	m3/h	0.0	3,329.4	3,329.4	3,333.4	3,329.0	684.7
	Liquid @T	m3/h	-	3,329.4	3,329.4	3,333.4	3,329.0	684.7
	Solids @T	m3/h	0.0	-	-	-	-	-
Percent solids	% Solids	wt%	100.0	-	-	-	-	-
Density	Density @T	t/m³	5.6	1.0	1.0	0.8	0.8	1.0
Water	Water	t/h	-	3,306.7	3,306.7	-	-	679.5
Elemental Flows	Cu	kg/h	-	5,029.6	5,029.6	5,017.1	-	24,670.1
	Ag	kg/h	3.4	0.4	0.4	-	-	-
	Fe	kg/h	-	2,696.9	2,696.9	-	-	-
Liquid Composition	Cu	g/L	-	1.5	1.5	1.5	-	36.0
	Ag	ppm	-	0.00011	0.00011	-	-	-
	Fe	g/L	-	0.8	0.8	-	-	-
Solid Fraction	Cu	%	-	-	-	-	-	-
	Ag	%	75.3	-	-	-	-	-
	Fe	%	-	-	-	-	-	-

Area Tag						Area 500: Electrowinning	
Stream - Tag			P_013	P_014	P_016	P_015	P_017
Properties		Unit	200-TK-04 Output to 500-EW-01 Input	500-EW-01 Output to Cu_Metal	400-ST-01 Output to Kerosene_Recycle_Outlet	500-EW-01 Output to 400-ST-01 Input	X_001 to Rafinate_Pond/Purge Input
Mass Flow	Total	t/h	704.3	5.2	2,693.0	699.2	3,325.0
	Liquid	t/h	704.3	-	2,693.0	699.2	3,325.0
	Solids	t/h	-	5.2	-	-	-
Volume Flow	Total @T	m3/h	684.7	0.6	3,325.8	684.1	3,324.3
	Liquid @T	m3/h	684.7	-	3,325.8	684.1	3,324.3
	Solids @T	m3/h	-	0.6	-	-	-
Percent solids	% Solids	wt%	-	100.0	-	-	-
Density	Density @T	t/m³	1.0	9.0	0.8	1.0	1.0
Water	Water	t/h	679.5	-	-	679.5	3,306.7
Elemental Flows	Cu	kg/h	24,670.1	5,170.6	-	19,653.0	12.6
	Ag	kg/h	-	-	-	-	0.4
	Fe	kg/h	-	-	-	-	2,696.9
Liquid Composition	Cu	g/L	36.0	-	-	28.7	0.0
	Ag	ppm	-	-	-	-	0.00011
	Fe	g/L	-	-	-	-	0.8
Solid Fraction	Cu	%	-	100.0	-	-	-
	Ag	%	-	-	-	-	-
	Fe	%	-	-	-	-	-

METS assumptions and calculations

ITEM	Value	Source	Comments
Area 200: ISCR			
Copper Recovery	40%	METS	
Copper Concentration	1.5 g/l	METS	Taken from ISCR concentration calculations
ISCR Solids Pull	5%	METS	5% of solids are brought up from ISCR wells
ISCR Acid Losses	9%	METS	9% of acid lost through ISCR Voids
Thickener U/F Solids %	40%	METS	
Area 300: Silver Percipitation			
Silver Precipitation Recovery	90%	METS	
Filter Press Efficiency	98%	METS	
Area 400: Solvent Extraction			
Stripping Recovery	95%	METS	
Extraction Ratio	99%	METS	
Organic:Inlet Aq Ratio	1 to 1	METS	Organics in Stripping double Cu g/l
Organic:Outlet Aq Ratui	5 to 1	METS	Used to aim for 40 g/l in electrowinning
Acid Regeneration Efficiency	84%	METS	16% of acid not recovered through SX
Area 500: Electrowinning			
EW Efficiency	99%	METS	



Sodium_Chloride_300
Sulphuric_Acid
Ferric_Sulphate
ProcessWaterAddition
P_006
P_018
P_017
P_019
P_020
P_021
Recycle_Streams
Raffinate_Pond/Purge
P_NotAStream
Acid_Regen_Inefficiency
300-TK-01
200-TK-03
Kerosene_Recycle_Inlet
P_011
P_008
P_009
P_005
P_004
300_PF_01
P_010
200-TK-01
ProcessWater_InletControl
FerricSulphate
SulphuricAcid
SodiumChloride_Barren
ISCR_WellBlock_Control
P_022
P_023
200-PO-01
P_002
200-TK-02
P_001
P_012
P_016
400-ST-01
Kerosene_Recycle_Outlet
P_007
200-TK-04
P_015
P_013
200-TH-01
GasFromAtmosphericPond
P_014
500-EW-01
Cu_Metal
Ag_Metal
P_024
O2_Dosing
TH-01_U/F_Density
P_003
Tailings_Pond
OreVein
Insitu_Leaching
OreVeinUnleached
Pond_Gas_Purge
ORE_FEED
ORE_UNLEACHED
Kerosene_Ratio_Control
Kerosene_Inlet_Limit
Aq_Stripping_Control
Kerosene_Outlet_Limit

APPENDIX E – Equipment List

Appendix items

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DOCUMENT COVER SHEET

CLIENT: Cobre Limited

PROJECT TITLE: ISCR Ngami Copper Project

PROJECT NO: J5945

DOCUMENT TITLE: ISCR Project Mechanical Equipment List

DOCUMENT NO: J5945-P-MEQ-000-001

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.

CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH

	NAME	DATE
OR		
CH		

Rev	Date	Revision	By	Ch'k	Appv.
1	14/10/24	Issued for Information	HM	MN	DC
0	27/09/24	Issued for Client Review	HM	MN	DC
C	26/09/24	Issued for Internal Review	HM	JB	DC
B	24/09/24	Issued for Internal Review	HM	MN	DC
A	9/09/24	Issued for Internal Review	HM	MN	DC

SOURCE CODES

The following codes are used to reference the criteria.

CODE	SOURCE
1	Client Supplied Data
2	Process Design Criteria
3	METS Calculated Value
4	METS Assumed Value
5	Market Specification
6	Vendor Supplied Data
7	METS Database
8	Other Sources

AREA NUMBERING

AREA	DESCRIPTION
100	In-Situ Well Field
200	Tank Farm and Ponds
300	Silver Precipitation
400	Solvent Extraction
500	Electrowinning
600	Site Services

Client
Cobre Limited

Project
ISCR Ngami Copper Project

Document Number
J5945-P-MEQ-000-001

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Estimated Power (kW)	Supplier	Capacity per unit	Units	Reference
Area 100	**In-Situ Well Field**									
3	100-PP-01	100	PP	01	Injection Well Pump	162.51	Global Pumps	52.64	m3/h	METS Database
3	100-IW-01	100	IW	01	Injection Well	-	KML	260.00	m	Client Supplied Data
2	100-RW-01	100	RW	01	Recovery Well	-	KML	390.00	m	Client Supplied Data
6	100-MW-01	100	MW	01	Monitoring Well	-	KML	260.00	m	Client Supplied Data
2	100-PP-02	100	PP	02	Recovery Well Lift Pump	138.44	Global Pumps	79.22	m3/h	Client Supplied Data
Area 200	**Tank Farm and Ponds**									
1	200-TK-01	200	TK	01	Barren Solution Makeup Tank	3.92	Butyl Products	315.92	m3	METS Database
1	200-TK-02	200	TK	02	Pregnant Leach Solution Tank	3.92	Butyl Products	316.41	m3	METS Database
1	200-TK-03	200	TK	03	Solvent Extraction Feed Tank	3.93	Butyl Products	316.80	m3	METS Database
1	200-TK-04	200	TK	04	Electrowinning Feed Tank	1.52	Butyl Products	65.15	m3	METS Database
1	200-TK-05	200	TK	05	Sulphuric Acid Storage Tank 1	1.14	Butyl Products	40.00	m3	METS Database
1	200-TK-06	200	TK	06	Sulphuric Acid Storage Tank 2	1.14	Butyl Products	40.00	m3	METS Database
1	200-TK-07	200	TK	07	Kerosene Storage Tank	3.46	Butyl Products	256.00	m3	METS Database
1	200-PO-01	200	PO	01	PLS Pond	-	Civil Contractor	3802.46	Ea	METS Assumed Value
1	200-PO-02	200	PO	02	ILS Pond	-	Civil Contractor	3802.46	m3	METS Assumed Value
1	200-PO-03	200	PO	03	Raw Water Pond	-	Civil Contractor	3802.46	m3	METS Assumed Value
1	200-PO-04	200	PO	04	Tailing Pond	-	Civil Contractor	7987.54	m3	METS Assumed Value
1	200-PO-05	200	PO	05	Raffinate Pond	-	Civil Contractor	3187.07	m3	METS Assumed Value
1	200-TH-01	200	TH	01	Thickener	3.49	Mclanahan	79.29	m3	Vendor Supplied Data
1	200-PP-01	200	PP	01	Raw Water Transfer Pump	2.80	Global Pumps	25.00	m3/h	METS Database
1	200-PP-02	200	PP	02	Thickener Underflow Pump	2.33	Global Pumps	25.00	m3/h	METS Database
1	200-PP-03	200	PP	03	Sulphuric Acid Offloading Pump 1	3.09	Global Pumps	40.00	m3/h	METS Database
1	200-PP-05	200	PP	05	Sulphuric Acid Offloading Pump 2	3.09	Global Pumps	40.00	m3/h	METS Database
1	200-PP-04	200	PP	04	Sulphuric Acid Dosing Pump 1	0.28	Global Pumps	0.11	m3/h	METS Database
1	200-PP-06	200	PP	06	Sulphuric Acid Dosing Pump 2	0.28	Global Pumps	0.11	m3/h	METS Database
1	200-PP-07	200	PP	07	Extract Feed Organics Pump	0.28	Global Pumps	0.11	m3/h	METS Database
1	200-PP-08	200	PP	08	Kerosene Offloading Pump	9.41	Global Pumps	256.00	m3/h	METS Database
1	200-PP-09	200	PP	09	Kerosene Feed Pump	6.22	Global Pumps	128.13	m3/h	METS Database
1	200-SW-01	200	SW	01	Safety Showers	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-02	200	SW	02	Safety Showers	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-03	200	SW	03	Sulphuric Acid Area Safety Shower	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-04	200	SW	04	Ferric Sulphate Safety Shower	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-05	200	SW	05	Organics Safety Showers	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-06	200	SW	06	Safety Showers	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-07	200	SW	07	Safety Showers	1.50	RSEA	1.00	ea	Other Sources

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Estimated Power (kW)	Supplier	Capacity per unit	Units	Reference
1	200-SI-01	200	SI	01	Ferric Sulphate Silo	-	Henan Taixing	0.20	m3	Other Sources
1	200-SI-02	200	SI	02	Sodium Chloride Silo	-	Henan Taixing	0.20	m3	Other Sources
1	200-SI-03	200	SI	03	Na2CO3 Flux Silo	-	Henan Taixing	0.20	m3	Other Sources
1	200-CV-01	200	CV	01	Ferric Sulphide Transfer Conveyor	0.20	Continental Conveyer Systems (pty) Ltd	2.25	t/h	METS Database
1	200-CV-02	200	CV	02	Sodium Chloride Transfer Conveyor	0.20	Continental Conveyer Systems (pty) Ltd	2.25	t/h	METS Database
1	200-CV-03	200	CV	03	Na2CO3 Flux Transfer Conveyor	0.20	Continental Conveyer Systems (pty) Ltd	2.25	t/h	METS Database
Area 300	**Silver Precipitation**									
1	300-TK-01	300	TK	01	PLS Silver Precipitation Feed Tank	3.92	Butyl Products	316.00	m3	METS Database
1	300-TK-02	300	TK	02	Filter Press Feed Tank	1.51	Butyl Products	64.00	m3	METS Database
1	300-TK-03	300	TK	03	Filter Press Filtrate Tank	3.92	Butyl Products	316.00	m3	METS Database
1	300-TK-04	300	TK	04	Clarifier Feed Tank	3.92	Butyl Products	316.00	m3	METS Database
1	300-CF-01	300	CF	01	Clarifier 01	11.84	Ecotec	79.21	m3	Market Specification
1	300-PF-01	300	PF	01	Filter Press	1.46	FLSmidth	0.11	t/h	METS Database
1	300-SF-01	300	SF	01	Sand Filter 01	0.64		16.00	m3	METS Assumed Value
1	300-SF-02	300	SF	02	Sand Filter 02	0.64		16.00	m3	METS Assumed Value
1	300-CF-02	300	CF	02	Clarifier 02	11.84	Ecotec	79.21	m3/h	Market Specification
1	300-PP-01	300	PP	01	Precipitation Transfer Pump	13.58	Global Pumps	44.00	m3/h	METS Database
1	300-PP-02	300	PP	02	Filter Press Tank Feed Pump	13.58	Global Pumps	44.00	m3/h	METS Database
1	300-PP-03	300	PP	03	Filter Press Feed Pump	4.86	Global Pumps	7.92	m3/h	METS Database
1	300-PP-04	300	PP	04	Sand Filter Feed Pump	29.27	Global Pumps	158.40	m3/h	METS Database
1	300-PP-05	300	PP	05	Clarifier Tank Feed Pump	29.27	Global Pumps	158.40	m3/h	METS Database
1	300-PP-06	300	PP	06	Clarifier Feed Pump	-	Global Pumps	0.00	m3/h	METS Database
1	300-CV-01	300	CV	01	Filter Cake Transfer Conveyor	0.20	Continental Conveyer Systems (pty) Ltd	2.25	t/h	METS Database
1	300-CV-02	300	CV	02	Ag Metal Transfer Conveyor	0.20	Continental Conveyer Systems (pty) Ltd	2.25	t/h	METS Database
1	300-DF-01	300	DF	01	Dryer	0.03	FEECO	0.22	kg/h	Vendor Supplied Data
1	300-FU-01	300	FU	01	Smelting Furnace	0.82	SAV Borel - Furnace	0.22	kg/h	METS Database
Area 400	**Solvent Extraction**									
1	400-TK-01	400	TK	01	Organic Feed Tank	4.41	Butyl Products	384.00	m3	METS Database
1	400-TK-02	400	TK	02	Loaded Organic Tank	4.41	Butyl Products	384.00	m3	METS Database
1	400-TK-03	400	TK	03	Barren Organic Tank	5.82	Butyl Products	192.00	m3	METS Database
2	400-SX-01	400	SX	01	Solvent Extraction Package	33.00	Sulzer	15.00	m3/h	METS Database
1	400-PP-01	400	PP	01	Organic Feed Pump	18.90	Global Pumps	128.13	m3/h	METS Database
1	400-PP-02	400	PP	02	Solvent Extraction Feed Pump	32.54	Global Pumps	316.78	m3/h	METS Database
1	400-PP-03	400	PP	03	Raffinate Solution Pump	21.45	Global Pumps	158.16	m3/h	METS Database
1	400-PP-04	400	PP	04	Loaded Organic Tank Pump	21.48	Global Pumps	158.59	m3/h	METS Database
1	400-PP-05	400	PP	05	Stripped Solution Pump	8.31	Global Pumps	32.58	m3/h	METS Database
1	400-PP-06	400	PP	06	Barren Organic Tank Pump	24.01	Global Pumps	190.81	m3/h	METS Database
1	400-EF-01	400	EF	01	Electrowinning Filter	0.71	Global Pumps	32.58	m3/h	METS Database
1	400-SW-01	400	SW	01	Safety Shower	1.50	RSEA	1.00	ea	Other Sources
Area 500	**Electrowinning**									

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Estimated Power (kW)	Supplier	Capacity per unit	Units	Reference
2	500-EW-01	500	EW	01	Electrowinning Cells	1,280.00	Kemix	33.00	m3/h	METS Database
1	500-TK-01	500	TK	01	Crystaliser Feed Tank	0.88	Butyl Products	26.06	m3	METS Database
1	500-CR-01	500	CR	01	Crystalliser	5.14	Nanjing FiveMen Machine Co., Ltd	6.52	m3	Other Sources
1	500-CF-01	500	CF	01	Copper Sulphate Centrifuge	10.06	Nanjing FiveMen Machine Co., Ltd	13.03	m3/h	Other Sources
1	500-FD-01	500	FD	01	Flash Dryer	6.27	FEECO	2047.95	kg/h	Vendor Supplied Data
1	500-CV-01	500	CV	01	Transfer Conveyor	0.20	Continental Conveyer Systems (pty) Ltd	2.25	t/h	METS Database
1	500-SW-01	500	SW	01	Safety Showers	1.50	RSEA	1.00	ea	Other Sources
1	500-PP-01	500	PP	01	Electrowinning Feed Pump	8.31	Global Pumps	32.58	m3/h	
1	500-PP02	500	PP	02	Spent Electrolyte Pump	8.31	Global Pumps	32.58	m3/h	METS Database
Area 600	**Site Services**									
Communication										
1					Site Communications	-				METS Database
1					Plant Control System	-			0	METS Database
Site Services										
1	600-TK-01	600	TK	01	Diesel Storage Package	-		1.00	set	Vendor Supplied Data
2	600-PP-03	600	PP	03	Bore Pump	93.80	Global Pumps	54.00	m3/hr	METS Database
2	600-PP-04	600	PP	04	Bore Water Transfer Pump	5.60	Global Pumps	42.00	m3/hr	METS Database
2	600-PP-05	600	PP	05	Raw Water Distribution Pump	5.60	Global Pumps	42.00	m3/hr	METS Database
2	600-PP-06	600	PP	06	Fire Water Pump	7.00	Global Pumps	77.40	m3/hr	METS Database
2	600-PP-07	600	PP	07	Plant Process Water Pump	5.60	Global Pumps	42.00	m3/hr	METS Database
2	600-PP-08	600	PP	08	Process Water Distribution Pump	5.60	Global Pumps	42.00	m3/hr	METS Database
2	600-PP-09	600	PP	09	RO Plant Feed Water Pump	3.70	Global Pumps	21.00	m3/hr	METS Database
2	600-PP-10	600	PP	10	Potable Water Tank Feed Pump	3.70	Global Pumps	21.00	m3/hr	METS Database
2	600-PP-11	600	PP	11	Potable Water Distribution Pump	2.40	Global Pumps	1.82	m3/hr	METS Database
2	600-PP-12	600	PP	12	Spray Pump	1.50	Global Pumps	26.51	m3/hr	METS Database
1	600-TK-03	600	TK	03	Bore Water Tank	-	Butyl products	475.00	m3	METS Database
1	600-TK-04	600	TK	04	Fire Water Tank	-	Butyl products	475.00	m3	METS Database
1	600-TK-05	600	TK	05	Raw Water Tank	-	Global Pumps	475.00	m3	METS Database
1	600-TK-06	600	TK	06	Process Water Tank	-	Butyl products	475.00	m3	METS Database
1	600-TK-07	600	TK	07	Potable Water Tank	-	Butyl products	33.63	m3	METS Database
1	600-TK-08	600	TK	08	Spray Water Tank	-	Butyl products	4.20	m3	METS Database
1	600-PS-01	600	PS	01	Power Package	-	JA DELMAS	1.00	kw	Other sources
1	600-SW-01	600	SW	01	Fuel Service Safety Showers	1.50	RSEA	1.00	Ea	Other Souirce
1	600-AF-01	600	AF	01	Air Package	-	Hitachi Air	200.00	L/s	METS Database
3	600-WB-01	600	WB	01	Water Bores	-	Local contractor	1.00	ea	METS Database
1	600-TP-01	600	TP	01	Bore Water Treatment Plant	152.52	Osmflo	107.21	m3/h	
1	600-TP-02	600	TP	02	RO Treatment Plant					METS Database

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DOCUMENT COVER SHEET

CLIENT: Cobre Limited

PROJECT TITLE: ISCR Ngami Copper Project

PROJECT NO: J5945

DOCUMENT TITLE: ISCR Project Mechanical Equipment List - Stage 2

DOCUMENT NO: J5945-P-MEQ-000-002

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.

CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH

	NAME	DATE
OR		
CH		

Rev	Date	Revision	By	Ch'k	Appv.
1	14/10/24	Issued for Information	EA	MN	DC
0	27/09/24	Issued for Client Review	HM	MN	DC
C	26/09/24	Issued for Internal Review	HM	JB	DC
B	24/09/24	Issued for Internal Review	HM	MN	DC
A	9/09/24	Issued for Internal Review	HM	MN	DC

SOURCE CODES

The following codes are used to reference the criteria.

CODE	SOURCE
1	Client Supplied Data
2	Process Design Criteria
3	METS Calculated Value
4	METS Assumed Value
5	Market Specification
6	Vendor Supplied Data
7	METS Database
8	Other Sources

AREA NUMBERING

AREA	DESCRIPTION
100	In-Situ Well Field
200	Tank Farm and Ponds
300	Silver Precipitation
400	Solvent Extraction
500	Electrowinning
600	Site Infrastructure

Client
Cobre Limited

Project
ISCR Ngami Copper Project

Document Number
J5945-P-MEQ-000-002

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Estimated Power (kW)	Supplier	Capacity per unit	Units	Reference
Area 100	**In-Situ Well Field**									
53	100-PP-01	100	PP	01	Injection Well Pump	3,103.15	Global Pumps	59.92	m3/h	METS Database
53	100-IW-01	100	IW	01	Injection Well	-	KML	295.94	m	Client Supplied Data
52	100-RW-01	100	RW	01	Recovery Well	-	KML	301.64	m	Client Supplied Data
106	100-MW-01	100	MW	01	Monitoring Well	-	KML	295.94	m	Client Supplied Data
52	100-PP-02	100	PP	02	Recovery Well Lift Pump	3,085.16	Global Pumps	61.27	m3/h	Client Supplied Data
Area 200	**Tank Farm and Ponds**									
1	200-TK-01	200	TK	01	Barren Solution Makeup Tank	23.64	Butyl Products	6324.46	m3	METS Database
1	200-TK-02	200	TK	02	Pregnant Leach Solution Tank	23.66	Butyl Products	6334.15	m3	METS Database
1	200-TK-03	200	TK	03	Solvent Extraction Feed Tank	23.68	Butyl Products	6342.03	m3	METS Database
1	200-TK-04	200	TK	04	Electrowinning Feed Tank	9.17	Butyl Products	1304.28	m3	METS Database
1	200-TK-05	200	TK	05	Sulphuric Acid Storage Tank 1	6.84	Butyl Products	800.76	m3	METS Database
1	200-TK-06	200	TK	06	Sulphuric Acid Storage Tank 2	6.84	Butyl Products	800.76	m3	METS Database
1	200-TK-07	200	TK	07	Kerosene Storage Tank	20.84	Butyl Products	5124.86	m3	METS Database
1	200-PO-01	200	PO	01	PLS Pond	-	Civil Contractor	76121.50	Ea	METS Assumed Value
1	200-PO-02	200	PO	02	ILS Pond	-	Civil Contractor	76121.50	m3	METS Assumed Value
1	200-PO-03	200	PO	03	Raw Water Pond	-	Civil Contractor	76121.50	m3	METS Assumed Value
1	200-PO-04	200	PO	04	Tailing Pond	-	Civil Contractor	159902.61	m3	METS Assumed Value
1	200-PO-05	200	PO	05	Raffinate Pond	-	Civil Contractor	63802.05	m3	METS Assumed Value
1	200-TH-01	200	TH	01	Thickener	21.03	Mclanahan	1587.28	m3	Vendor Supplied Data
5	200-PP-01	200	PP	01	Raw Water Transfer Pump	14.00	Global Pumps	25.00	m3/h	METS Database
5	200-PP-02	200	PP	02	Thickener Underflow Pump	11.65	Global Pumps	25.00	m3/h	METS Database
5	200-PP-03	200	PP	03	Sulphuric Acid Offloading Pump 1	13.55	Global Pumps	32.15	m3/h	METS Database
5	200-PP-05	200	PP	05	Sulphuric Acid Offloading Pump 2	13.55	Global Pumps	32.15	m3/h	METS Database
5	200-PP-04	200	PP	04	Sulphuric Acid Dosing Pump 1	1.20	Global Pumps	0.09	m3/h	METS Database
5	200-PP-06	200	PP	06	Sulphuric Acid Dosing Pump 2	1.20	Global Pumps	0.09	m3/h	METS Database
5	200-PP-07	200	PP	07	Extract Feed Organics Pump	1.40	Global Pumps	0.11	m3/h	METS Database
5	200-PP-08	200	PP	08	Kerosene Offloading Pump	41.30	Global Pumps	205.77	m3/h	METS Database
5	200-PP-09	200	PP	09	Kerosene Feed Pump	27.25	Global Pumps	102.99	m3/h	METS Database
1	200-SW-01	200	SW	01	Safety Showers	9.06	RSEA	20.02	ea	Other Sources
1	200-SW-02	200	SW	02	Safety Showers	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-03	200	SW	03	Sulphuric Acid Area Safety Shower	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-04	200	SW	04	Ferric Sulphate Safety Shower	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-05	200	SW	05	Organics Safety Showers	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-06	200	SW	06	Safety Showers	1.50	RSEA	1.00	ea	Other Sources
1	200-SW-07	200	SW	07	Safety Showers	1.50	RSEA	1.00	ea	Other Sources

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Estimated Power (kW)	Supplier	Capacity per unit	Units	Reference
1	200-SI-01	200	SI	01	Ferric Sulphate Silo	-	Henan Taixing	4.00	m3	Other Sources
1	200-SI-02	200	SI	02	Sodium Chloride Silo	-	Henan Taixing	0.20	m3	Other Sources
1	200-SI-03	200	SI	03	Na2CO3 Flux Silo	-	Henan Taixing	0.20	m3	Other Sources
1	200-CV-01	200	CV	01	Ferric Sulphide Transfer Conveyor	0.20	Continental Conveyer Systems (pty) Ltd	2.25	t/h	METS Database
1	200-CV-02	200	CV	02	Sodium Chloride Transfer Conveyor	0.20	Continental Conveyer Systems (pty) Ltd	2.25	t/h	METS Database
1	200-CV-03	200	CV	03	Na2CO3 Flux Transfer Conveyor	0.20	Continental Conveyer Systems (pty) Ltd	2.25	t/h	METS Database
Area 300	**Silver Precipitation**									
1	300-TK-01	300	TK	01	PLS Silver Precipitation Feed Tank	23.64	Butyl Products	6326.00	m3	METS Database
1	300-TK-02	300	TK	02	Filter Press Feed Tank	9.07	Butyl Products	1281.22	m3	METS Database
1	300-TK-03	300	TK	03	Filter Press Filtrate Tank	23.64	Butyl Products	6326.00	m3	METS Database
1	300-TK-04	300	TK	04	Clarifier Feed Tank	23.64	Butyl Products	6326.00	m3	METS Database
1	300-CF-01	300	CF	01	Clarifier 01	71.47	Ecotec	1585.73	m3	Market Specification
1	300-PF-01	300	PF	01	Filter Press	8.80	FLSmidth	2.15	t/h	METS Database
1	300-SF-01	300	SF	01	Sand Filter 01	3.83		320.30	m3	METS Assumed Value
1	300-SF-02	300	SF	02	Sand Filter 02	3.83		320.30	m3	METS Assumed Value
1	300-CF-02	300	CF	02	Clarifier 02	71.47	Ecotec	1585.73	m3/h	Market Specification
5	300-PP-01	300	PP	01	Precipitation Transfer Pump	59.55	Global Pumps	35.37	m3/h	METS Database
5	300-PP-02	300	PP	02	Filter Press Tank Feed Pump	59.55	Global Pumps	35.37	m3/h	METS Database
5	300-PP-03	300	PP	03	Filter Press Feed Pump	21.30	Global Pumps	6.37	m3/h	METS Database
5	300-PP-04	300	PP	04	Sand Filter Feed Pump	128.40	Global Pumps	127.32	m3/h	METS Database
5	300-PP-05	300	PP	05	Clarifier Tank Feed Pump	128.40	Global Pumps	127.32	m3/h	METS Database
5	300-PP-06	300	PP	06	Clarifier Feed Pump	-	Global Pumps	0.00	m3/h	METS Database
1	300-CV-01	300	CV	01	Filter Cake Transfer Conveyor	1.20	Continental Conveyer Systems (pty) Ltd	45.04	t/h	METS Database
1	300-CV-02	300	CV	02	Ag Metal Transfer Conveyor	1.20	Continental Conveyer Systems (pty) Ltd	45.04	t/h	METS Database
1	300-DF-01	300	DF	01	Dryer	0.16	FEECO	4.30	kg/h	Vendor Supplied Data
1	300-FU-01	300	FU	01	Smelting Furnace	4.94	SAV Borel - Furnace	4.30	kg/h	METS Database
Area 400	**Solvent Extraction**									
1	400-TK-01	400	TK	01	Organic Feed Tank	26.58	Butyl Products	7687.30	m3	METS Database
1	400-TK-02	400	TK	02	Loaded Organic Tank	26.58	Butyl Products	7687.30	m3	METS Database
1	400-TK-03	400	TK	03	Barren Organic Tank	88.20	Butyl Products	384.36	m3	METS Database
20	400-SX-01	400	SX	01	Solvent Extraction Package	330.00	Sulzer	15.00	m3/h	METS Database
5	400-PP-01	400	PP	01	Organic Feed Pump	82.90	Global Pumps	102.99	m3/h	METS Database
5	400-PP-02	400	PP	02	Solvent Extraction Feed Pump	142.70	Global Pumps	254.63	m3/h	METS Database
5	400-PP-03	400	PP	03	Raffinate Solution Pump	94.10	Global Pumps	127.13	m3/h	METS Database
5	400-PP-04	400	PP	04	Loaded Organic Tank Pump	94.25	Global Pumps	127.47	m3/h	METS Database
5	400-PP-05	400	PP	05	Stripped Solution Pump	36.45	Global Pumps	26.18	m3/h	METS Database
5	400-PP-06	400	PP	06	Barren Organic Tank Pump	276.50	Global Pumps	766.85	m3/h	METS Database
1	400-EF-01	400	EF	01	Electrowinning Filter	4.26	Global Pumps	652.14	m3/h	METS Database
1	400-SW-01	400	SW	01	Safety Shower	1.50	RSEA	1.00	ea	Other Sources
Area 500	**Electrowinning**									

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Estimated Power (kW)	Supplier	Capacity per unit	Units	Reference
20	500-EW-01	500	EW	01	Electrowinning Cells	12,800.00	Kemix	33.00	m3/h	METS Database
1	500-TK-01	500	TK	01	Crystaliser Feed Tank	5.29	Butyl Products	521.71	m3	METS Database
1	500-CR-01	500	CR	01	Crystalliser	31.00	Nanjing FiveMen Machine Co., Ltd	130.43	m3	Other Sources
1	500-CF-01	500	CF	01	Copper Sulphate Centrifuge	60.69	Nanjing FiveMen Machine Co., Ltd	260.86	m3/h	Other Sources
1	500-FD-01	500	FD	01	Flash Dryer	37.81	FEECO	40997.84	kg/h	Vendor Supplied Data
1	500-CV-01	500	CV	01	Transfer Conveyor	1.20	Continental Conveyer Systems (pty) Ltd	45.04	t/h	METS Database
1	500-SW-01	500	SW	01	Safety Showers	1.50	RSEA	1.00	ea	Other Sources
5	500-PP-01	500	PP	01	Electrowinning Feed Pump	36.45	Global Pumps	26.18	m3/h	
5	500-PP02	500	PP	02	Spent Electrolyte Pump	36.45	Global Pumps	26.18	m3/h	METS Database
Area 600	**Site Infrastructure**									
Site Services										
1	600-TK-01	600	TK	01	Diesel Storage Package	-		1.00	set	Vendor Supplied Data
10	600-PP-03	600	PP	03	Bore Pump	469.00	Global Pumps	54.00	m3/hr	METS Database
10	600-PP-04	600	PP	04	Bore Water Transfer Pump	28.00	Global Pumps	42.00	m3/hr	METS Database
10	600-PP-05	600	PP	05	Raw Water Distribution Pump	28.00	Global Pumps	42.00	m3/hr	METS Database
10	600-PP-06	600	PP	06	Fire Water Pump	35.00	Global Pumps	77.40	m3/hr	METS Database
10	600-PP-07	600	PP	07	Plant Process Water Pump	28.00	Global Pumps	42.00	m3/hr	METS Database
10	600-PP-08	600	PP	08	Process Water Distribution Pump	28.00	Global Pumps	42.00	m3/hr	METS Database
10	600-PP-09	600	PP	09	RO Plant Feed Water Pump	16.30	Global Pumps	16.88	m3/hr	METS Database
10	600-PP-10	600	PP	10	Potable Water Tank Feed Pump	16.30	Global Pumps	16.88	m3/hr	METS Database
10	600-PP-11	600	PP	11	Potable Water Distribution Pump	12.00	Global Pumps	1.82	m3/hr	METS Database
10	600-PP-12	600	PP	12	Spray Pump	7.50	Global Pumps	26.51	m3/hr	METS Database
1	600-TK-03	600	TK	03	Bore Water Tank	-	Butyl products	9509.03	m3	METS Database
1	600-TK-04	600	TK	04	Fire Water Tank	-	Butyl products	9509.03	m3	METS Database
1	600-TK-05	600	TK	05	Raw Water Tank	-	Global Pumps	9509.03	m3	METS Database
1	600-TK-06	600	TK	06	Process Water Tank	-	Butyl products	9509.03	m3	METS Database
1	600-TK-07	600	TK	07	Potable Water Tank	-	Butyl products	673.24	m3	METS Database
1	600-TK-08	600	TK	08	Spray Water Tank	-	Butyl products	84.08	m3	METS Database
1	600-PS-01	600	PS	01	Connection to Power Grid	-	JA DELMAS	1.00	kw	Other sources
1	600-SW-01	600	SW	01	Fuel Service Safety Showers	1.50	RSEA	1.00	Ea	Other Souirce
1	600-AF-01	600	AF	01	Air Package	-	Hitachi Air	4003.80	L/s	METS Database
3	600-WB-01	600	WB	01	Water Bores	-	Local contractor	1.00	ea	
1	600-TP-01	600	TP	01	Bore Water Treatment Plant	152.52	Osmflo	107.21	m3/h	
1	600-TP-02	600	TP	02	RO Treatment Plant					METS Database

APPENDIX F – CAPEX

Appendix items

METS ENGINEERING
PROCESS + INNOVATION
+61 8 9421 9000
info@metsengineering.com
www.metsengineering.com
S12, L3, 44 Parliament Place, West Perth 6005

DOCUMENT COVER SHEET

CLIENT: Cobre Limited

PROJECT TITLE: ISCR Ngami Copper Project

PROJECT NO: J5945

DOCUMENT TITLE: ISCR Project CAPEX Estimation - Stage 1

DOCUMENT NO: J5945-P-CA-000-001

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.			
CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH
	NAME	DATE	
OR			
CH			

Rev	Date	Revision	By	Ch'k	Appv.
1	14/10/24	Issued for Information	HM	MN	DC
0	27/09/24	Issued for Client Review	HM	MN	DC
C	26/09/24	Issued for Internal Review	HM	JB	DC
B	24/09/24	Issued for Internal Review	HM	MN	DC
A	9/09/24	Issued for Internal Review	HM	MN	DC

SOURCE CODES

The following codes are used to reference the criteria.

CODE	SOURCE
1	Client Supplied Data
2	Process Design Criteria
3	METS Calculated Value
4	METS Assumed Value
5	Market Specification
6	Vendor Supplied Data
7	METS Database
8	Other Sources

AREA NUMBERING

AREA	DESCRIPTION
100	In-Situ Well Field
200	Tank Farm and Ponds
300	Silver Precipitation
400	Solvent Extraction
500	Electrowinning
600	Site Infrastructure

Document	CAPEX Estimate
Area	Assumptions
Client	Cobre Limited
Project	ISCR Ngami Copper Project
Job #	J5945
Doc #	J5945-P-CA-000-001
Rev	1

Assumptions			
1. All mobile equipment run on diesel.			
2. Currency conversion	Currency conversions are indicative only		
	1 USD	1.54	AUD
	1 GBP	1.99	AUD
	1 ZAR	0.08	AUD
	1 EUR	1.72	AUD
	1 SGD	1.15	AUD
	1 BWP	0.11	AUD
3. All equipments are costed based on nominal flowrates			
4. Roads include drainage, clearings, signage, and markings.			

Cobre Limited		
ISCR Ngami Copper Project		
Date 27/09/2024	**Project Number** J5945	**CAPITAL COST ESTIMATE**

Insitu Leaching

	AREA	Equipment	Earthworks	Concrete	Structural Steelwork	Mechanical Installation	Pipework	Electrical and Instrumentation	Roads, etc	Freight	Total per Item
			5 %	2 %	10 %	35 %	10 %	7 %	2 %	9 %	80 %
	Direct Costs	AUD	AUD	AUD	AUD	AUD	AUD	AUD	AUD	AUD	AUD
1	100 In-Situ Well Field	$ 1,334,000.00	$ 66,700.00	$ 26,680.00	$ 133,400.00	$ 466,900.00	$ 133,400.00	$ 93,380.00	$ 26,680.00	$ 120,060.00	$ 2,401,200.00
2	200 Tank Farm and Ponds	$ 1,132,000.00	$ 56,600.00	$ 22,640.00	$ 113,200.00	$ 396,200.00	$ 113,200.00	$ 79,240.00	$ 22,640.00	$ 101,880.00	$ 2,037,600.00
3	300 Silver Precipitation	$ 907,131.50	$ 45,356.58	$ 18,142.63	$ 90,713.15	$ 317,496.03	$ 90,713.15	$ 63,499.21	$ 18,142.63	$ 81,641.84	$ 1,632,836.70
4	400 Solvent Extraction	$ 5,236,000.00	$ 261,800.00	$ 104,720.00	$ 523,600.00	$ 1,832,600.00	$ 523,600.00	$ 366,520.00	$ 104,720.00	$ 471,240.00	$ 9,424,800.00
5	500 Electrowinning	$ 1,573,000.00	$ 78,650.00	$ 31,460.00	$ 157,300.00	$ 550,550.00	$ 157,300.00	$ 110,110.00	$ 31,460.00	$ 141,570.00	$ 2,831,400.00
6	600 Site Infrastructure	$ 8,909,000.00	$ 445,450.00	$ 178,180.00	$ 890,900.00	$ 3,118,150.00	$ 890,900.00	$ 623,630.00	$ 178,180.00	$ 801,810.00	$ 16,036,200.00
											Sub Total Direct Cost
	Direct Cost Total	**$ 19,091,131.50**	**$ 954,556.58**	**$ 381,822.63**	**$ 1,909,113.15**	**$ 6,681,896.03**	**$ 1,909,113.15**	**$ 1,336,379.21**	**$ 381,822.63**	**$ 1,718,201.84**	**$34,364,036.70**

	Indirect Costs			Total per Item AUD
1	Working Capital	10%	10% of Direct Costs	$ 3,436,403.67
2	Insurance	3%	3% of Equipment Cost	$ 1,030,921.10
3	EPCM	10%	10% of Direct Costs	$ 3,436,403.67
4	Owner's Costs	3%	3% of Direct Costs	$ 1,030,921.10
5	Contingency	30%	30% of Direct Costs	$ 10,309,211.01
6	Commissioning	5%	5% of Direct Costs	$ 1,718,201.84
7	Workforce accommodation & meals, temp services	2%	2% of Direct Costs	$ 687,280.73
8	Spares and tools	2%	2% of Equipment Cost	$ 381,822.63
				Sub Total Indirect Cost
				$ 22,031,165.75

TOTAL COST	***AUD***	***$ 56,395,202.45***
TOTAL COST	***USD***	***$ 36,667,881.96***

Client
Cobre Limited
Project
ISCR Ngami Copper Project
Document Number
J5945-P-CA-000-001

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Equipment Price (AUD)	Estimated Power (kW)	Scaled Cost AUD	Supplier	Capacity per unit	Scaled Capacity	Units	Scaled Power (kW)	Basis Capacity	Units	Basis Power (kW)	Basis Cost (AUD)	Reference Code	Reference
Area 100	**In-Situ Well Field**																		
3	100-PP-01	100	PP	01	Injection Well Pump	$ 188,000	162.51	$ 62,448.92	Global Pumps	52.64	157.93	m3/h	54.17	54.00	m3/h	55.00	$ 63,409.00	7	METS Database
3	100-IW-01	100	IW	01	Injection Well	$ 336,000	-	$ 111,671.00	KML	260.00	780.00	m	0.00	260.00	m	0.00	$ 111,671.00	1	Client Supplied Data
2	100-RW-01	100	RW	01	Recovery Well	$ 285,000	-	$ 142,427.93	KML	390.00	780.00	m	0.00	260.00	m3	0.00	$ 111,671.00	1	Client Supplied Data
6	100-MW-01	100	MW	01	Monitoring Well	$ 365,000	-	$ 60,683.00	KML	260.00	1,560.00	m	0.00	260.00	m3/h	0.00	$ 60,683.00	1	Client Supplied Data
2	100-PP-02	100	PP	02	Recovery Well Lift Pump	$ 160,000	138.44	$ 79,801.11	Global Pumps	79.22	158.44	m3/h	69.22	54.00	m3/h	55.00	$ 63,409.00	1	Client Supplied Data
					Total for Area 100	**$ 1,334,000**	300.95												
Area 200	**Tank Farm and Ponds**																		
1	200-TK-01	200	TK	01	Barren Solution Makeup Tank	$ 75,000	3.92	$ 74,132.55	Butyl Products	315.92	315.92	m3	3.92	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-02	200	TK	02	Pregnant Leach Solution Tank	$ 75,000	3.92	$ 74,200.67	Butyl Products	316.41	316.41	m3	3.92	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-03	200	TK	03	Solvent Extraction Feed Tank	$ 75,000	3.93	$ 74,256.08	Butyl Products	316.80	316.80	m3	3.93	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-04	200	TK	04	Electrowinning Feed Tank	$ 29,000	1.52	$ 28,748.64	Butyl Products	65.15	65.15	m3	1.52	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-05	200	TK	05	Sulphuric Acid Storage Tank 1	$ 22,000	1.14	$ 21,453.42	Butyl Products	40.00	40.00	m3	1.14	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-06	200	TK	06	Sulphuric Acid Storage Tank 2	$ 22,000	1.14	$ 21,453.42	Butyl Products	40.00	40.00	m3	1.14	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-07	200	TK	07	Kerosene Storage Tank	$ 66,000	3.46	$ 65,343.81	Butyl Products	256.00	256.00	m3	3.46	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-PO-01	200	PO	01	PLS Pond	$ 42,000	-	$ 41,540.86	Civil Contractor	3802.46	3,802.46	Ea	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-PO-02	200	PO	02	ILS Pond	$ 42,000	-	$ 41,540.86	Civil Contractor	3802.46	3,802.46	m3	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-PO-03	200	PO	03	Raw Water Pond	$ 42,000	-	$ 41,540.86	Civil Contractor	3802.46	3,802.46	m3	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-PO-04	200	PO	04	Tailing Pond	$ 65,000	-	$ 64,846.19	Civil Contractor	7987.54	7,987.54	m3	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-PO-05	200	PO	05	Raffinate Pond	$ 38,000	-	$ 37,365.60	Civil Contractor	3187.07	3,187.07	m3	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-TH-01	200	TH	01	Thickener	$ 418,000	3.49	$ 417,881.49	Mclanahan	79.29	79.29	m3	3.49	460.00	m3	10.00	$ 1,200,000.00	6	Vendor Supplied Data
1	200-PP-01	200	PP	01	Raw Water Transfer Pump	$ 4,000	2.80	$ 3,254.21	Global Pumps	25.00	85.76	m3/h	2.80	77.40	m3/h	5.50	$ 6,411.00	7	METS Database
1	200-PP-02	200	PP	02	Thickener Underflow Pump	$ 4,000	2.33	$ 3,567.93	Global Pumps	25.00	0.23	m3/h	2.33	12.00	m3/h	1.50	$ 2,297.00	7	METS Database
1	200-PP-03	200	PP	03	Sulphuric Acid Offloading Pump 1	$ 5,000	3.09	$ 4,730.30	Global Pumps	40.00	40.00	m3/h	3.09	12.00	m3/h	1.50	$ 2,297.00	7	METS Database
1	200-PP-05	200	PP	05	Sulphuric Acid Offloading Pump 2	$ 5,000	3.09	$ 4,730.30	Global Pumps	40.00	40.00	m3/h	3.09	12.00	m3/h	1.50	$ 2,297.00	7	METS Database
1	200-PP-04	200	PP	04	Sulphuric Acid Dosing Pump 1	$ 3,000	0.28	$ 2,044.02	Global Pumps	0.11	0.11	m3/h	0.28	90.00	m3/h	15.00	$ 112,595.00	7	METS Database
1	200-PP-06	200	PP	06	Sulphuric Acid Dosing Pump 2	$ 3,000	0.28	$ 2,044.02	Global Pumps	0.11	0.11	m3/h	0.28	90.00	m3/h	15.00	$ 112,595.00	7	METS Database
1	200-PP-07	200	PP	07	Extract Feed Organics Pump	$ 3,000	0.28	$ 2,044.02	Global Pumps	0.11	0.11	m3/h	0.28	90.00	m3/h	15.00	$ 112,595.00	7	METS Database
1	200-PP-08	200	PP	08	Kerosene Offloading Pump	$ 17,000	9.41	$ 16,276.94	Global Pumps	256.00	256.00	m3/h	9.41	12.00	m3/h	1.50	$ 2,595.00	7	METS Database
1	200-PP-09	200	PP	09	Kerosene Feed Pump	$ 11,000	6.22	$ 10,745.33	Global Pumps	128.13	128.13	m3/h	6.22	12.00	m3/h	1.50	$ 2,595.00	7	METS Database
1	200-SW-01	200	SW	01	Safety Showers	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-02	200	SW	02	Safety Showers	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-03	200	SW	03	Sulphuric Acid Area Safety Shower	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-04	200	SW	04	Ferric Sulphate Safety Shower	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-05	200	SW	05	Organics Safety Showers	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-06	200	SW	06	Safety Showers	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-07	200	SW	07	Safety Showers	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SI-01	200	SI	01	Ferric Sulphate Silo	$ 9,000	-	$ 8,217.87	Henan Taixing	0.20	0.20	m3	0.00	2.83	m3	0.00	$ 40,300.00	8	Other Sources
1	200-SI-02	200	SI	02	Sodium Chloride Silo	$ 9,000	-	$ 8,217.87	Henan Taixing	0.20	0.20	m3	0.00	2.83	m3	0.00	$ 40,300.00	8	Other Sources
1	200-SI-03	200	SI	03	Na2CO3 Flux Silo	$ 9,000	-	$ 8,217.87	Henan Taixing	0.20	0.20	m3	0.00	2.83	m3	0.00	$ 40,300.00	8	Other Sources
1	200-CV-01	200	CV	01	Ferric Sulphide Transfer Conveyor	$ 6,000	0.20	$ 5,636.54	Continental Conveyer Systems (pty) Ltd	2.25	5.00	t/h	0.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	200-CV-02	200	CV	02	Sodium Chloride Transfer Conveyor	$ 6,000	0.20	$ 5,636.54	Continental Conveyer Systems (pty) Ltd	2.25	5.00	t/h	0.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	200-CV-03	200	CV	03	Na2CO3 Flux Transfer Conveyor	$ 6,000	0.20	$ 5,636.54	Continental Conveyer Systems (pty) Ltd	2.25	5.00	t/h	0.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
					Total for Area 200	**$ 1,132,000**	61.40												
Area 300	**Silver Precipitation**																		
1	300-TK-01	300	TK	01	PLS Silver Precipitation Feed Tank	$ 75,000	3.92	$ 74,143.44	Butyl Products	316.00	316.00	m3	3.92	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	300-TK-02	300	TK	02	Filter Press Feed Tank	$ 29,000	1.51	$ 28,442.55	Butyl Products	64.00	64.00	m3	1.51	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	300-TK-03	300	TK	03	Filter Press Filtrate Tank	$ 75,000	3.92	$ 74,143.44	Butyl Products	316.00	316.00	m3	3.92	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	300-TK-04	300	TK	04	Clarifier Feed Tank	$ 75,000	3.92	$ 74,143.44	Butyl Products	316.00	316.00	m3	3.92	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	300-CF-01	300	CF	01	Clarifier 01	$ 131,000	11.84	$ 130,228.86	Ecotec	79.21	79.21	m3	11.84	8.04	m3	3.00	$ 33,005.70	5	Market Specification
1	300-PF-01	300	PF	01	Filter Press	$ 90,000	1.46	$ 89,791.80	FLSmidth	0.11	0.11	t/h	1.46	16.65	t/h	30.00	$ 1,850,000.00	7	METS Database
1	300-SF-01	300	SF	01	Sand Filter 01	$ 24,000	0.64	$ 23,456.42		16.00	16.00	m3	0.64	500.00	m3	5.00	$ 185,000.00	4	METS Assumed Value
1	300-SF-02	300	SF	02	Sand Filter 02	$ 24,000	0.64	$ 23,456.42		16.00	16.00	m3	0.64	500.00	m3	5.00	$ 185,000.00	4	METS Assumed Value
1	300-CF-02	300	CF	02	Clarifier 02	$ 131,000	11.84	$ 130,228.76	Ecotec	79.21	79.21	m3/h	11.84	8.04	m3/h	3.00	$ 33,005.70	5	Market Specification
1	300-PP-01	300	PP	01	Precipitation Transfer Pump	$ 24,000	13.58	$ 23,478.96	Global Pumps	44.00	44.00	m3/h	13.58	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
1	300-PP-02	300	PP	02	Filter Press Tank Feed Pump	$ 24,000	13.58	$ 23,478.96	Global Pumps	44.00	44.00	m3/h	13.58	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
1	300-PP-03	300	PP	03	Filter Press Feed Pump	$ 9,000	4.86	$ 8,391.55	Global Pumps	7.92	7.92	m3/h	4.86	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
1	300-PP-04	300	PP	04	Sand Filter Feed Pump	$ 51,000	29.27	$ 50,636.09	Global Pumps	158.40	158.40	m3/h	29.27	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
1	300-PP-05	300	PP	05	Clarifier Tank Feed Pump	$ 51,000	29.27	$ 50,636.09	Global Pumps	158.40	158.40	m3/h	29.27	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
1	300-PP-06	300	PP	06	Clarifier Feed Pump	$ 79,000	-	$ 78,989.38	Global Pumps	0.00	332.36	m3/h	0.00	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
1	300-CV-01	300	CV	01	Filter Cake Transfer Conveyor	$ 4,000	0.20	$ 3,490.92	Continental Conveyer Systems (pty) Ltd	2.25	2.25	t/h	0.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	300-CV-02	300	CV	02	Ag Metal Transfer Conveyor	$ 4,000	0.20	$ 3,490.92	Continental Conveyer Systems (pty) Ltd	2.25	2.25	t/h	0.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	300-DF-01	300	DF	01	Dryer	$ 6,000	0.03	$ 5,328.87	FEECO	0.22	0.22	kg/h	0.03	1,700.00	kg/h	5.60	$ 1,162,500.00	6	Vendor Supplied Data
1	300-FU-01	300	FU	01	Smelting Furnace	$ 1,000	0.82	$ 680.49	SAV Borel - Furnace	0.22	0.22	kg/h	0.82	880.00	kg/h	120.00	$ 100,000.00	7	METS Database
					Total for 300	**$ 907,132**	131.50												
Area 400	**Solvent Extraction**																		
1	400-TK-01	400	TK	01	Organic Feed Tank	$ 84,000	4.41	$ 83,341.09	Butyl Products	384.00	384.00	m3	4.41	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	400-TK-02	400	TK	02	Loaded Organic Tank	$ 84,000	4.41	$ 83,341.09	Butyl Products	384.00	384.00	m3	4.41	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	400-TK-03	400	TK	03	Barren Organic Tank	$ 84,000	5.82	$ 83,341.09	Butyl Products	192.00	384.00	m3	2.91	475.00	m3	5.00	$ 94,684.00	7	METS Database

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Equipment Price (AUD)	Estimated Power (kW)	Scaled Cost AUD	Supplier	Capacity per unit	Scaled Capacity	Units	Scaled Power (kW)	Basis Capacity	Units	Basis Power (kW)	Basis Cost (AUD)	Reference Code	Reference
2	400-SX-01	400	SX	01	Solvent Extraction Package	$ 4,650,000	33.00	$ 2,324,840.00	Sulzer	15.00	15.00	m3/h	16.50	15.00	m3/h	16.50	$ 2,324,840.00	7	METS Database
1	400-PP-01	400	PP	01	Organic Feed Pump	$ 49,000	18.90	$ 48,571.98	Global Pumps	128.13	128.13	m3/h	18.90	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
1	400-PP-02	400	PP	02	Solvent Extraction Feed Pump	$ 84,000	32.54	$ 83,608.53	Global Pumps	316.78	316.78	m3/h	32.54	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
1	400-PP-03	400	PP	03	Raffinate Solution Pump	$ 56,000	21.45	$ 55,112.18	Global Pumps	158.16	158.16	m3/h	21.45	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
1	400-PP-04	400	PP	04	Loaded Organic Tank Pump	$ 56,000	21.48	$ 55,202.81	Global Pumps	158.59	158.59	m3/h	21.48	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
1	400-PP-05	400	PP	05	Stripped Solution Pump	$ 22,000	8.31	$ 21,356.68	Global Pumps	32.58	32.58	m3/h	8.31	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
1	400-PP-06	400	PP	06	Barren Organic Tank Pump	$ 62,000	24.01	$ 61,680.72	Global Pumps	190.81	190.81	m3/h	24.01	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
1	400-EF-01	400	EF	01	Electrowinning Filter	$ 2,000	0.71	$ 1,663.44	Global Pumps	32.58	32.58	m3/h	0.71	68.36	m3/h	1.10	$ 2,595.00	7	METS Database
1	400-SW-01	400	SW	01	Safety Shower	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
					Total for Area 400	**$ 5,236,000**	176.54												
Area 500	**Electrowinning**																		
2	500-EW-01	500	EW	01	Electrowinning Cells	$ 163,000	1,280.00	$ 81,164.23	Kemix	33.00	13.89	m3/h	640.00	15.00	m3/h	33.00	$ 85,000.00	7	METS Database
1	500-TK-01	500	TK	01	Crystaliser Feed Tank	$ 17,000	0.88	$ 16,590.26	Butyl Products	26.06	26.06	m3	0.88	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	500-CR-01	500	CR	01	Crystalliser	$ 17,000	5.14	$ 16,332.13	Nanjing FiveMen Machine Co., Ltd	6.52	6.52	m3	5.14	0.50	m3	1.10	$ 3,500.00	8	Other Sources
1	500-CF-01	500	CF	01	Copper Sulphate Centrifuge	$ 33,000	10.06	$ 32,161.19	Nanjing FiveMen Machine Co., Ltd	13.03	13.03	m3/h	10.06	8.00	m3/h	7.50	$ 24,000.00	8	Other Sources
1	500-FD-01	500	FD	01	Flash Dryer	$ 1,300,000	6.27	$ 1,299,914.51	FEECO	2047.95	2,047.95	kg/h	6.27	1,700.00	kg/h	5.60	$ 1,162,500.00	6	Vendor Supplied Data
1	500-CV-01	500	CV	01	Transfer Conveyor	$ 4,000	0.20	$ 3,490.92	Continental Conveyer Systems (pty) Ltd	2.25	2.25	t/h	0.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	500-SW-01	500	SW	01	Safety Showers	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	500-PP-01	500	PP	01	Electrowinning Feed Pump	$ 18,000	8.31	$ 17,352.78	Global Pumps	32.58	32.58	m3/h	8.31	1.12	m3/h	1.10	$ 2,297.00	7	
1	500-PP02	500	PP	02	Spent Electrolyte Pump	$ 18,000	8.31	$ 17,352.60	Global Pumps	32.58	32.58	m3/h	8.31	1.12	m3/h	1.10	$ 2,297.00	7	METS Database
					Total for Area 500	**$ 1,573,000**	1,320.67												
Area 600	**Site Infrastructure**																		
Buildings																			
1					Mechanical/ Electrical Workshop	$ 80,000	-	$ 80,000.00			Fixed Size			Fixed Size			$ 159,915.43		
1					Warehouse/Store	$ 125,000	-	$ 124,050.00			Fixed Size			Fixed Size			$ 124,050.00		
1					Gatehouse/Site Security	$ 11,000	-	$ 10,342.80			Fixed Size			Fixed Size			$ 10,342.80		
1					Offices & Amenities	$ 50,000	-	$ 50,000.00			Fixed Size			Fixed Size			$ 50,000.00		
1					Laboratory	$ 76,000	-	$ 75,524.28			Fixed Size	0	-	Fixed Size			$ 75,524.28		
1					Accommodation/Ablution Units	$ 200,000	-	$ 200,000.00			Fixed Size			Fixed Size			$ 395,372.08		
1					Recreation Centre	$ 84,000	-	$ 83,545.80			Fixed Size			Fixed Size			$ 83,545.80		
1					Dining/Kitchen	$ 159,000	-	$ 158,595.84			Fixed Size			Fixed Size			$ 158,595.84		
Communication																			
1					Site Communications	$ 759,000	-	$ 758,281.50			Fixed Size			Fixed Size			$ 758,281.50		
1					Plant Control System	$ 2,000,000	-	$ 2,000,000.00			Fixed Size	0	-	Fixed Size			$ 2,000,000.00		
Site Services																			
1	600-TK-01	600	TK	01	Diesel Storage Package	$ 865,000	-	$ 864,176.10		1.00	1.00	set		1.00	set		$ 864,176.10	8	Vendor Supplied Data
2	600-PP-03	600	PP	03	Bore Pump	$ 127,000	93.80	$ 63,409.00	Global Pumps	54.00	54.00	m3/hr	46.90	54.00	m3/hr	46.90	$ 63,409.00	7	METS Database
2	600-PP-04	600	PP	04	Bore Water Transfer Pump	$ 13,000	5.60	$ 6,405.00	Global Pumps	42.00	42.00	m3/hr	2.80	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
2	600-PP-05	600	PP	05	Raw Water Distribution Pump	$ 13,000	5.60	$ 6,405.00	Global Pumps	42.00	42.00	m3/hr	2.80	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
2	600-PP-06	600	PP	06	Fire Water Pump	$ 13,000	7.00	$ 6,411.00	Global Pumps	77.40	77.40	m3/hr	3.50	77.40	m3/hr	3.50	$ 6,411.00	7	METS Database
2	600-PP-07	600	PP	07	Plant Process Water Pump	$ 13,000	5.60	$ 6,405.00	Global Pumps	42.00	42.00	m3/hr	2.80	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
2	600-PP-08	600	PP	08	Process Water Distribution Pump	$ 13,000	5.60	$ 6,405.00	Global Pumps	42.00	42.00	m3/hr	2.80	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
2	600-PP-09	600	PP	09	RO Plant Feed Water Pump	$ 9,000	3.70	$ 4,225.73	Global Pumps	21.00	42.00	m3/hr	1.85	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
2	600-PP-10	600	PP	10	Potable Water Tank Feed Pump	$ 9,000	3.70	$ 4,225.73	Global Pumps	21.00	42.00	m3/hr	1.85	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
2	600-PP-11	600	PP	11	Potable Water Distribution Pump	$ 6,000	2.40	$ 2,889.00	Global Pumps	1.82	1.82	m3/hr	1.20	1.82	m3/hr	1.20	$ 2,889.00	7	METS Database
2	600-PP-12	600	PP	12	Spray Pump	$ 11,000	1.50	$ 5,077.00	Global Pumps	26.51	26.51	m3/hr	0.75	26.51	m3/hr	0.75	$ 5,077.00	7	METS Database
1	600-TK-03	600	TK	03	Bore Water Tank	$ 95,000	-	$ 94,684.00	Butyl products	475.00	475.00	m3	0.00	475.00	m3	0.00	$ 94,684.00	7	METS Database
1	600-TK-04	600	TK	04	Fire Water Tank	$ 95,000	-	$ 94,684.00	Butyl products	475.00	475.00	m3	0.00	475.00	m3	0.00	$ 94,684.00	7	METS Database
1	600-TK-05	600	TK	05	Raw Water Tank	$ 95,000	-	$ 94,684.00	Global Pumps	475.00	475.00	m3	0.00	475.00	m3	0.00	$ 94,684.00	7	METS Database
1	600-TK-06	600	TK	06	Process Water Tank	$ 95,000	-	$ 94,684.00	Butyl products	475.00	475.00	m3	0.00	475.00	m3	0.00	$ 94,684.00	7	METS Database
1	600-TK-07	600	TK	07	Potable Water Tank	$ 12,000	-	$ 11,073.40	Butyl products	33.63	33.63	m3	0.00	72.00	m3	0.00	$ 17,484.14	7	METS Database
1	600-TK-08	600	TK	08	Spray Water Tank	$ 4,000	-	$ 3,126.66	Butyl products	4.20	4.20	m3	0.00	24.00	m3	0.00	$ 8,897.29	7	METS Database
1	600-PS-01	600	PS	01	Power Package	$ 2,165,000	-	$ 2,164,327.50	JA DELMAS	1.00	1.00	kw	0.00	1.00	kw	0.00	$ 2,164,327.50	8	Other sources
1	600-SW-01	600	SW	01	Fuel Service Safety Showers	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	Ea	1.50	1.00	Ea	1.50	$ 2,372.95	8	Other Souirce
1	600-AF-01	600	AF	01	Air Package	$ 296,000	-	$ 295,432.00	Hitachi Air	200.00	200.00	L/s	0.00	200.00	L/s		$ 295,432.00	7	METS Database
3	600-WB-01	600	WB	01	Water Bores	$ 641,000	-	$ 213,571.25	Local contractor	1.00	3.00	ea	0.00	1.00	ea	0.00	$ 213,571.25		
1	600-TP-01	600	TP	01	Bore Water Treatment Plant	$ 772,000	152.52	$ 771,743.14	Osmflo	107.21	107.21	m3/h	152.52	219.00	m3/h	234.13	$ 1,184,705.00	7	
1	600-TP-02	600	TP	02	RO Treatment Plant														METS Database
					Total for Area 600	**$ 8,909,000**	288.52												

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DOCUMENT COVER SHEET

CLIENT: Cobre Limited

PROJECT TITLE: ISCR Ngami Copper Project

PROJECT NO: J5945

DOCUMENT TITLE: ISCR Project CAPEX Estimation - Stage 2

DOCUMENT NO: J5945-P-CA-000-002

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.

CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH

	NAME	DATE
OR		
CH		

Rev	Date	Revision	By	Ch'k	Appv.
2	14/10/24	Issued for Information	EA	MN	DC
1	8/10/24	Issued for Client Review	EA	MN	DC
0	27/09/24	Issued for Client Review	HM	MN	DC
C	26/09/24	Issued for Internal Review	HM	JB	DC
B	24/09/24	Issued for Internal Review	HM	MN	DC
A	9/09/24	Issued for Internal Review	HM	MN	DC

SOURCE CODES

The following codes are used to reference the criteria.

CODE	SOURCE
1	Client Supplied Data
2	Process Design Criteria
3	METS Calculated Value
4	METS Assumed Value
5	Market Specification
6	Vendor Supplied Data
7	METS Database
8	Other Sources

AREA NUMBERING

AREA	DESCRIPTION
100	In-Situ Well Field
200	Tank Farm and Ponds
300	Silver Precipitation
400	Solvent Extraction
500	Electrowinning
600	Site Infrastructure

Document	CAPEX Estimate
Area	Assumptions
Client	Cobre Limited
Project	ISCR Ngami Copper Project
Job #	J5945
Doc #	J5945-P-CA-000-002
Rev	2

Assumptions			
1. All mobile equipment run on diesel.			
2. Currency conversion	Currency conversions are indicative only		
	1 USD	1.54	AUD
	1 GBP	1.99	AUD
	1 ZAR	0.08	AUD
	1 EUR	1.72	AUD
	1 SGD	1.15	AUD
	1 BWP	0.11	AUD
3. All equipments are costed based on nominal flowrates			
4. Roads include drainage, clearings, signage, and markings.			

		Cobre Limited
		ISCR Ngami Copper Project
Date 27/09/2024	**Project Number** J5945	**CAPITAL COST ESTIMATE**

Insitu Leaching

		AREA	Equipment	Earthworks	Concrete	Structural Steelwork	Mechanical Installation	Pipework	Electrical and Instrumentation	Roads, etc	Freight	Total per Item
				5 %	2 %	10 %	35 %	10 %	7 %	2 %	9 %	80 %
		Direct Costs	AUD	AUD	AUD	AUD	AUD	AUD	AUD	AUD	AUD	AUD
1	100	In-Situ Well Field	$ 26,834,000.00	$ 1,341,700.00	$ 536,680.00	$ 2,683,400.00	$ 9,391,900.00	$ 2,683,400.00	$ 1,878,380.00	$ 536,680.00	$ 2,415,060.00	$ 48,301,200.00
2	200	Tank Farm and Ponds	$ 6,643,000.00	$ 332,150.00	$ 132,860.00	$ 664,300.00	$ 2,325,050.00	$ 664,300.00	$ 465,010.00	$ 132,860.00	$ 597,870.00	$ 11,957,400.00
3	300	Silver Precipitation	$ 6,716,644.09	$ 335,832.20	$ 134,332.88	$ 671,664.41	$ 2,350,825.43	$ 671,664.41	$ 470,165.09	$ 134,332.88	$ 604,497.97	$ 12,089,959.36
4	400	Solvent Extraction	$ 49,894,000.00	$ 2,494,700.00	$ 997,880.00	$ 4,989,400.00	$ 17,462,900.00	$ 4,989,400.00	$ 3,492,580.00	$ 997,880.00	$ 4,490,460.00	$ 89,809,200.00
5	500	Electrowinning	$ 10,884,000.00	$ 544,200.00	$ 217,680.00	$ 1,088,400.00	$ 3,809,400.00	$ 1,088,400.00	$ 761,880.00	$ 217,680.00	$ 979,560.00	$ 19,591,200.00
6	600	Site Infrastructure	$ 35,055,000.00	$ 1,752,750.00	$ 701,100.00	$ 3,505,500.00	$ 12,269,250.00	$ 3,505,500.00	$ 2,453,850.00	$ 701,100.00	$ 3,154,950.00	$ 63,099,000.00
												Sub Total Direct Cost
		Direct Cost Total	**$ 136,026,644.09**	**$ 6,801,332.20**	**$ 2,720,532.88**	**$ 13,602,664.41**	**$ 47,609,325.43**	**$ 13,602,664.41**	**$ 9,521,865.09**	**$ 2,720,532.88**	**$ 12,242,397.97**	**$244,847,959.36**

				Total per Item
	Indirect Costs			AUD
1	Working Capital	10%	10% of Direct Costs	$ 24,484,795.94
2	Insurance	3%	3% of Equipment Cost	$ 7,345,438.78
3	EPCM	10%	10% of Direct Costs	$ 24,484,795.94
4	Owner's Costs	3%	3% of Direct Costs	$ 7,345,438.78
5	Contingency	30%	30% of Direct Costs	$ 73,454,387.81
6	Commissioning	5%	5% of Direct Costs	$ 12,242,397.97
7	Workforce accommodation & meals, temp services	2%	2% of Direct Costs	$ 4,896,959.19
8	Spares and tools	2%	2% of Equipment Cost	$ 2,720,532.88
				Sub Total Indirect Cost
				$ 156,974,747.28

TOTAL COST	***AUD***	***$ 401,822,706.64***
TOTAL COST	***USD***	***$ 261,263,138.26***

Client
Cobre Limited
Project
ISCR Ngami Copper Project
Document Number
J5945-P-CA-000-002

METS ENGINEERING
PROCESS + INNOVATION

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Equipment Price (AUD)	Estimated Power	Scaled Cost AUD	Supplier	Capacity per unit	Stage 1 Capacity	Scaled Capacity	Units	Scaled Power (kW)	Basis Capacity	Units	Basis Power (kW)	Basis Cost (AUD)	Reference Code	Reference
Area 100	**In-Situ Well Field**																			
53	100-PP-01	100	PP	01	Injection Well Pump	$ 3,578,000	3,103.15	$ 67,494.19	Global Pumps	59.92	157.93	3,175.87	m3/h	58.55	54.00	m3/h	55.00	$ 63,409.00	7	METS Database
53	100-IW-01	100	IW	01	Injection Well	$ 6,397,000	-	$ 120,692.96	KML	295.94	780.00	15,685.02	m	0.00	260.00	m	0.00	$ 111,671.00	1	Client Supplied Data
52	100-RW-01	100	RW	01	Recovery Well	$ 6,349,000	-	$ 122,080.26	KML	301.64	780.00	15,685.02	m	0.00	260.00	m3	0.00	$ 111,671.00	1	Client Supplied Data
106	100-MW-01	100	MW	01	Monitoring Well	$ 6,953,000	-	$ 65,585.61	KML	295.94	1560.00	31,370.04	m	0.00	260.00	m3/h	0.00	$ 60,683.00	1	Client Supplied Data
52	100-PP-02	100	PP	02	Recovery Well Lift Pump	$ 3,557,000	3,085.16	$ 68,400.49	Global Pumps	61.27	158.44	3,185.99	m3/h	59.33	54.00	m3/h	55.00	$ 63,409.00	1	Client Supplied Data
					Total for Area 100	**$ 26,834,000**	6,188.31													
Area 200	**Tank Farm and Ponds**																			
1	200-TK-01	200	TK	01	Barren Solution Makeup Tank	$ 448,000	23.64	$ 447,583.80	Butyl Products	6324.46	315.92	6,324.46	m3	23.64	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-02	200	TK	02	Pregnant Leach Solution Tank	$ 448,000	23.66	$ 447,995.08	Butyl Products	6334.15	316.41	6,334.15	m3	23.66	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-03	200	TK	03	Solvent Extraction Feed Tank	$ 449,000	23.68	$ 448,329.59	Butyl Products	6342.03	316.80	6,342.03	m3	23.68	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-04	200	TK	04	Electrowinning Feed Tank	$ 174,000	9.17	$ 173,573.17	Butyl Products	1304.28	65.15	1,304.28	m3	9.17	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-05	200	TK	05	Sulphuric Acid Storage Tank 1	$ 130,000	6.84	$ 129,527.47	Butyl Products	800.76	40.00	800.76	m3	6.84	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-06	200	TK	06	Sulphuric Acid Storage Tank 2	$ 130,000	6.84	$ 129,527.47	Butyl Products	800.76	40.00	800.76	m3	6.84	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-TK-07	200	TK	07	Kerosene Storage Tank	$ 395,000	20.84	$ 394,520.74	Butyl Products	5124.86	256.00	5,124.86	m3	20.84	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	200-PO-01	200	PO	01	PLS Pond	$ 251,000	-	$ 250,807.73	Civil Contractor	76121.50	3802.46	76,121.50	Ea	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-PO-02	200	PO	02	ILS Pond	$ 251,000	-	$ 250,807.73	Civil Contractor	76121.50	3802.46	76,121.50	m3	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-PO-03	200	PO	03	Raw Water Pond	$ 251,000	-	$ 250,807.73	Civil Contractor	76121.50	3802.46	76,121.50	m3	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-PO-04	200	PO	04	Tailing Pond	$ 392,000	-	$ 391,516.30	Civil Contractor	159902.61	7987.54	159,902.61	m3	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-PO-05	200	PO	05	Raffinate Pond	$ 226,000	-	$ 225,599.07	Civil Contractor	63802.05	3187.07	63,802.05	m3	0.00	1,500,000.00	m3	0.00	$ 1,500,000.00	4	METS Assumed Value
1	200-TH-01	200	TH	01	Thickener	$ 2,524,000	21.03	$ 2,523,007.60	Mclanahan	1587.28	79.29	1,587.28	m3	21.03	460.00	m3	10.00	$ 1,200,000.00	6	Vendor Supplied Data
5	200-PP-01	200	PP	01	Raw Water Transfer Pump	$ 17,000	14.00	$ 3,254.21	Global Pumps	25.00	85.76	344.69	m3/h	2.80	77.40	m3/h	5.50	$ 6,411.00	7	METS Database
5	200-PP-02	200	PP	02	Thickener Underflow Pump	$ 18,000	11.65	$ 3,567.93	Global Pumps	25.00	0.23	0.93	m3/h	2.33	12.00	m3/h	1.50	$ 2,297.00	7	METS Database
5	200-PP-03	200	PP	03	Sulphuric Acid Offloading Pump 1	$ 21,000	13.55	$ 4,149.33	Global Pumps	32.15	40.00	160.76	m3/h	2.71	12.00	m3/h	1.50	$ 2,297.00	7	METS Database
5	200-PP-05	200	PP	05	Sulphuric Acid Offloading Pump 2	$ 21,000	13.55	$ 4,149.33	Global Pumps	32.15	40.00	160.76	m3/h	2.71	12.00	m3/h	1.50	$ 2,297.00	7	METS Database
5	200-PP-04	200	PP	04	Sulphuric Acid Dosing Pump 1	$ 9,000	1.20	$ 1,792.98	Global Pumps	0.09	0.11	0.45	m3/h	0.24	90.00	m3/h	15.00	$ 112,595.00	7	METS Database
5	200-PP-06	200	PP	06	Sulphuric Acid Dosing Pump 2	$ 9,000	1.20	$ 1,792.98	Global Pumps	0.09	0.11	0.45	m3/h	0.24	90.00	m3/h	15.00	$ 112,595.00	7	METS Database
5	200-PP-07	200	PP	07	Extract Feed Organics Pump	$ 11,000	1.40	$ 2,044.02	Global Pumps	0.11	0.11	0.43	m3/h	0.28	90.00	m3/h	15.00	$ 112,595.00	7	METS Database
5	200-PP-08	200	PP	08	Kerosene Offloading Pump	$ 72,000	41.30	$ 14,277.81	Global Pumps	205.77	256.00	1,028.86	m3/h	8.26	12.00	m3/h	1.50	$ 2,595.00	7	METS Database
5	200-PP-09	200	PP	09	Kerosene Feed Pump	$ 48,000	27.25	$ 9,425.59	Global Pumps	102.99	128.13	514.95	m3/h	5.45	12.00	m3/h	1.50	$ 2,595.00	7	METS Database
1	200-SW-01	200	SW	01	Safety Showers	$ 3,000	9.06	$ 2,372.95	RSEA	20.02	1.00	20.02	ea	9.06	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-02	200	SW	02	Safety Showers	$ 15,000	1.50	$ 14,326.96	RSEA	1.00	1.00	20.02	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-03	200	SW	03	Sulphuric Acid Area Safety Shower	$ 15,000	1.50	$ 14,326.96	RSEA	1.00	1.00	20.02	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-04	200	SW	04	Ferric Sulphate Safety Shower	$ 15,000	1.50	$ 14,326.96	RSEA	1.00	1.00	20.02	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-05	200	SW	05	Organics Safety Showers	$ 15,000	1.50	$ 14,326.96	RSEA	1.00	1.00	20.02	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-06	200	SW	06	Safety Showers	$ 15,000	1.50	$ 14,326.96	RSEA	1.00	1.00	20.02	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SW-07	200	SW	07	Safety Showers	$ 15,000	1.50	$ 14,326.96	RSEA	1.00	1.00	20.02	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
1	200-SI-01	200	SI	01	Ferric Sulphate Silo	$ 50,000	-	$ 49,616.32	Henan Taixing	4.00	0.20	4.00	m3	0.00	2.83	m3	0.00	$ 40,300.00	8	Other Sources
1	200-SI-02	200	SI	02	Sodium Chloride Silo	$ 50,000	-	$ 49,616.32	Henan Taixing	0.20	0.20	4.00	m3	0.00	2.83	m3	0.00	$ 40,300.00	8	Other Sources
1	200-SI-03	200	SI	03	Na2CO3 Flux Silo	$ 50,000	-	$ 49,616.32	Henan Taixing	0.20	0.20	4.00	m3	0.00	2.83	m3	0.00	$ 40,300.00	8	Other Sources
1	200-CV-01	200	CV	01	Ferric Sulphide Transfer Conveyor	$ 35,000	0.20	$ 34,031.23	Continental Conveyer Systems (pty) Ltd	2.25	5.00	100.10	t/h	0.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	200-CV-02	200	CV	02	Sodium Chloride Transfer Conveyor	$ 35,000	0.20	$ 34,031.23	Continental Conveyer Systems (pty) Ltd	2.25	5.00	100.10	t/h	0.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	200-CV-03	200	CV	03	Na2CO3 Flux Transfer Conveyor	$ 35,000	0.20	$ 34,031.23	Continental Conveyer Systems (pty) Ltd	2.25	5.00	100.10	t/h	0.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
					Total for Area 200	**$ 6,643,000**	279.46													
Area 300	**Silver Precipitation**																			
1	300-TK-01	300	TK	01	PLS Silver Precipitation Feed Tank	$ 448,000	23.64	$ 447,649.51	Butyl Products	6326.00	316.00	6,326.00	m3	23.64	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	300-TK-02	300	TK	02	Filter Press Feed Tank	$ 172,000	9.07	$ 171,725.13	Butyl Products	1281.22	64.00	1,281.22	m3	9.07	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	300-TK-03	300	TK	03	Filter Press Filtrate Tank	$ 448,000	23.64	$ 447,649.51	Butyl Products	6326.00	316.00	6,326.00	m3	23.64	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	300-TK-04	300	TK	04	Clarifier Feed Tank	$ 448,000	23.64	$ 447,649.51	Butyl Products	6326.00	316.00	6,326.00	m3	23.64	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	300-CF-01	300	CF	01	Clarifier 01	$ 787,000	71.47	$ 786,271.73	Ecotec	1585.73	79.21	1,585.73	m3	71.47	8.04	m3	3.00	$ 33,005.70	5	Market Specification
1	300-PF-01	300	PF	01	Filter Press	$ 543,000	8.80	$ 542,128.32	FLSmidth	2.15	0.11	2.15	t/h	8.80	16.65	t/h	30.00	$ 1,850,000.00	7	METS Database
1	300-SF-01	300	SF	01	Sand Filter 01	$ 142,000	3.83	$ 141,620.84		320.30	16.00	320.30	m3	3.83	500.00	m3	5.00	$ 185,000.00	4	METS Assumed Value
1	300-SF-02	300	SF	02	Sand Filter 02	$ 142,000	3.83	$ 141,620.84		320.30	16.00	320.30	m3	3.83	500.00	m3	5.00	$ 185,000.00	4	METS Assumed Value
1	300-CF-02	300	CF	02	Clarifier 02	$ 787,000	71.47	$ 786,271.09	Ecotec	1585.73	79.21	1,585.73	m3/h	71.47	8.04	m3/h	3.00	$ 33,005.70	5	Market Specification
5	300-PP-01	300	PP	01	Precipitation Transfer Pump	$ 271,000	59.55	$ 54,094.05	Global Pumps	35.37	44.00	176.84	m3/h	11.91	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
5	300-PP-02	300	PP	02	Filter Press Tank Feed Pump	$ 271,000	59.55	$ 54,094.05	Global Pumps	35.37	44.00	176.84	m3/h	11.91	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
5	300-PP-03	300	PP	03	Filter Press Feed Pump	$ 97,000	21.30	$ 19,333.62	Global Pumps	6.37	7.92	31.83	m3/h	4.26	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
5	300-PP-04	300	PP	04	Sand Filter Feed Pump	$ 584,000	128.40	$ 116,662.40	Global Pumps	127.32	158.40	636.61	m3/h	25.68	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
5	300-PP-05	300	PP	05	Clarifier Tank Feed Pump	$ 584,000	128.40	$ 116,662.40	Global Pumps	127.32	158.40	636.61	m3/h	25.68	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
5	300-PP-06	300	PP	06	Clarifier Feed Pump	$ 910,000	-	$ 181,986.65	Global Pumps	0.00	332.36	1,335.74	m3/h	0.00	1.12	m3/h	1.50	$ 2,595.00	7	METS Database
1	300-CV-01	300	CV	01	Filter Cake Transfer Conveyor	$ 22,000	1.20	$ 21,076.83	Continental Conveyer Systems (pty) Ltd	45.04	2.25	45.04	t/h	1.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	300-CV-02	300	CV	02	Ag Metal Transfer Conveyor	$ 22,000	1.20	$ 21,076.83	Continental Conveyer Systems (pty) Ltd	45.04	2.25	45.04	t/h	1.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	300-DF-01	300	DF	01	Dryer	$ 33,000	0.16	$ 32,173.65	FEECO	4.30	0.22	4.30	kg/h	0.16	1,700.00	kg/h	5.60	$ 1,162,500.00	6	Vendor Supplied Data
1	300-FU-01	300	FU	01	Smelting Furnace	$ 5,000	4.94	$ 4,108.54	SAV Borel - Furnace	4.30	0.22	4.30	kg/h	4.94	880.00	kg/h	120.00	$ 100,000.00	7	METS Database
					Total for 300	**$ 6,716,644**	644.09													
Area 400	**Solvent Extraction**																			
1	400-TK-01	400	TK	01	Organic Feed Tank	$ 504,000	26.58	$ 503,181.42	Butyl Products	7687.30	384.00	7,687.30	m3	26.58	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	400-TK-02	400	TK	02	Loaded Organic Tank	$ 504,000	26.58	$ 503,181.42	Butyl Products	7687.30	384.00	7,687.30	m3	26.58	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	400-TK-03	400	TK	03	Barren Organic Tank	$ 504,000	88.20	$ 503,181.42	Butyl Products	384.36	384.00	7,687.30	m3	4.41	475.00	m3	5.00	$ 94,684.00	7	METS Database
20	400-SX-01	400	SX	01	Solvent Extraction Package	$ 46,497,000	330.00	$ 2,324,840.00	Sulzer	15.00	15.00	30.00	m3/h	16.50	15.00	m3/h	16.50	$ 2,324,840.00	7	METS Database

Quantity	Equipment Number	Section Number	Equipment	Tag	Equipment Name	Equipment Price (AUD)	Estimated Power	Scaled Cost AUD	Supplier	Capacity per unit	Stage 1 Capacity	Scaled Capacity	Units	Scaled Power (kW)	Basis Capacity	Units	Basis Power (kW)	Basis Cost (AUD)	Reference Code	Reference
5	400-PP-01	400	PP	01	Organic Feed Pump	$ 214,000	82.90	$ 42,606.38	Global Pumps	102.99	128.13	514.95	m3/h	16.58	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
5	400-PP-02	400	PP	02	Solvent Extraction Feed Pump	$ 367,000	142.70	$ 73,339.74	Global Pumps	254.63	316.78	1,273.14	m3/h	28.54	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
5	400-PP-03	400	PP	03	Raffinate Solution Pump	$ 242,000	94.10	$ 48,343.31	Global Pumps	127.13	158.16	635.63	m3/h	18.82	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
5	400-PP-04	400	PP	04	Loaded Organic Tank Pump	$ 243,000	94.25	$ 48,422.81	Global Pumps	127.47	158.59	637.37	m3/h	18.85	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
5	400-PP-05	400	PP	05	Stripped Solution Pump	$ 94,000	36.45	$ 18,733.66	Global Pumps	26.18	32.58	130.92	m3/h	7.29	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
5	400-PP-06	400	PP	06	Barren Organic Tank Pump	$ 711,000	276.50	$ 142,108.56	Global Pumps	766.85	190.81	766.85	m3/h	55.30	1.12	m3/h	1.10	$ 2,827.00	7	METS Database
1	400-EF-01	400	EF	01	Electrowinning Filter	$ 11,000	4.26	$ 10,043.20	Global Pumps	652.14	32.58	652.14	m3/h	4.26	68.36	m3/h	1.10	$ 2,595.00	7	METS Database
1	400-SW-01	400	SW	01	Safety Shower	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	20.02	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
					Total for Area 400	**$ 49,894,000**	1,204.02													
Area 500	**Electrowinning**																			
20	500-EW-01	500	EW	01	Electrowinning Cells	$ 2,461,000	12,800.00	$ 123,021.97	Kemix	33.00	13.89	27.78	m3/h	640.00	15.00	m3/h	33.00	$ 85,000.00	7	METS Database
1	500-TK-01	500	TK	01	Crystaliser Feed Tank	$ 101,000	5.29	$ 100,165.60	Butyl Products	521.71	26.06	521.71	m3	5.29	475.00	m3	5.00	$ 94,684.00	7	METS Database
1	500-CR-01	500	CR	01	Crystalliser	$ 99,000	31.00	$ 98,607.11	Nanjing FiveMen Machine Co., Ltd	130.43	6.52	130.43	m3	31.00	0.50	m3	1.10	$ 3,500.00	8	Other Sources
1	500-CF-01	500	CF	01	Copper Sulphate Centrifuge	$ 195,000	60.69	$ 194,176.84	Nanjing FiveMen Machine Co., Ltd	260.86	13.03	260.86	m3/h	60.69	8.00	m3/h	7.50	$ 24,000.00	8	Other Sources
1	500-FD-01	500	FD	01	Flash Dryer	$ 7,849,000	37.81	$ 7,848,383.54	FEECO	40997.84	2047.95	40,997.84	kg/h	37.81	1,700.00	kg/h	5.60	$ 1,162,500.00	6	Vendor Supplied Data
1	500-CV-01	500	CV	01	Transfer Conveyor	$ 22,000	1.20	$ 21,076.83	Continental Conveyer Systems (pty) Ltd	45.04	2.25	45.04	t/h	1.20	1.12	t/h	0.13	$ 2,297.00	7	METS Database
1	500-SW-01	500	SW	01	Safety Showers	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	20.02	ea	1.50	1.00	ea	1.50	$ 2,372.95	8	Other Sources
5	500-PP-01	500	PP	01	Electrowinning Feed Pump	$ 77,000	36.45	$ 15,221.51	Global Pumps	26.18	32.58	130.92	m3/h	7.29	1.12	m3/h	1.10	$ 2,297.00	7	
5	500-PP02	500	PP	02	Spent Electrolyte Pump	$ 77,000	36.45	$ 15,221.36	Global Pumps	26.18	32.58	130.92	m3/h	7.29	1.12	m3/h	1.10	$ 2,297.00	7	METS Database
					Total for Area 500	**$ 10,884,000**	13,010.39													
Area 600	**Site Infrastructure**																			
Site Services																				
1	600-TK-01	600	TK	01	Diesel Storage Package	$ 865,000	-	$ 864,176.10		1.00	1.00	20.02	set		1.00	set		$ 864,176.10	8	Vendor Supplied Data
10	600-PP-03	600	PP	03	Bore Pump	$ 635,000	469.00	$ 63,409.00	Global Pumps	54.00	54.00	217.03	m3/hr	46.90	54.00	m3/hr	46.90	$ 63,409.00	7	METS Database
10	600-PP-04	600	PP	04	Bore Water Transfer Pump	$ 65,000	28.00	$ 6,405.00	Global Pumps	42.00	42.00	168.80	m3/hr	2.80	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
10	600-PP-05	600	PP	05	Raw Water Distribution Pump	$ 65,000	28.00	$ 6,405.00	Global Pumps	42.00	42.00	168.80	m3/hr	2.80	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
10	600-PP-06	600	PP	06	Fire Water Pump	$ 65,000	35.00	$ 6,411.00	Global Pumps	77.40	77.40	311.07	m3/hr	3.50	77.40	m3/hr	3.50	$ 6,411.00	7	METS Database
10	600-PP-07	600	PP	07	Plant Process Water Pump	$ 65,000	28.00	$ 6,405.00	Global Pumps	42.00	42.00	168.80	m3/hr	2.80	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
10	600-PP-08	600	PP	08	Process Water Distribution Pump	$ 65,000	28.00	$ 6,405.00	Global Pumps	42.00	42.00	168.80	m3/hr	2.80	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
10	600-PP-09	600	PP	09	RO Plant Feed Water Pump	$ 38,000	16.30	$ 3,706.73	Global Pumps	16.88	42.00	168.80	m3/hr	1.63	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
10	600-PP-10	600	PP	10	Potable Water Tank Feed Pump	$ 38,000	16.30	$ 3,706.73	Global Pumps	16.88	42.00	168.80	m3/hr	1.63	42.00	m3/hr	2.80	$ 6,405.00	7	METS Database
10	600-PP-11	600	PP	11	Potable Water Distribution Pump	$ 29,000	12.00	$ 2,889.00	Global Pumps	1.82	1.82	7.31	m3/hr	1.20	1.82	m3/hr	1.20	$ 2,889.00	7	METS Database
10	600-PP-12	600	PP	12	Spray Pump	$ 51,000	7.50	$ 5,077.00	Global Pumps	26.51	26.51	106.54	m3/hr	0.75	26.51	m3/hr	0.75	$ 5,077.00	7	METS Database
1	600-TK-03	600	TK	03	Bore Water Tank	$ 572,000	-	$ 571,665.56	Butyl products	9509.03	475.00	9,509.03	m3	0.00	475.00	m3	0.00	$ 94,684.00	7	METS Database
1	600-TK-04	600	TK	04	Fire Water Tank	$ 572,000	-	$ 571,665.56	Butyl products	9509.03	475.00	9,509.03	m3	0.00	475.00	m3	0.00	$ 94,684.00	7	METS Database
1	600-TK-05	600	TK	05	Raw Water Tank	$ 572,000	-	$ 571,665.56	Global Pumps	9509.03	475.00	9,509.03	m3	0.00	475.00	m3	0.00	$ 94,684.00	7	METS Database
1	600-TK-06	600	TK	06	Process Water Tank	$ 572,000	-	$ 571,665.56	Butyl products	9509.03	475.00	9,509.03	m3	0.00	475.00	m3	0.00	$ 94,684.00	7	METS Database
1	600-TK-07	600	TK	07	Potable Water Tank	$ 67,000	-	$ 66,856.92	Butyl products	673.24	33.63	673.24	m3	0.00	72.00	m3	0.00	$ 17,484.14	7	METS Database
1	600-TK-08	600	TK	08	Spray Water Tank	$ 19,000	-	$ 18,877.57	Butyl products	84.08	4.20	84.08	m3	0.00	24.00	m3	0.00	$ 8,897.29	7	METS Database
1	600-PS-01	600	PS	01	Connection to Power Grid	$ 27,500,000	-	$ 27,500,000.00	JA DELMAS	1.00	1.00	20.02	kw	0.00	1.00	kw	0.00	$ 27,500,000.00	8	Other sources
1	600-SW-01	600	SW	01	Fuel Service Safety Showers	$ 3,000	1.50	$ 2,372.95	RSEA	1.00	1.00	20.02	Ea	1.50	1.00	Ea	1.50	$ 2,372.95	8	Other Souirce
1	600-AF-01	600	AF	01	Air Package	$ 1,784,000	-	$ 1,783,704.73	Hitachi Air	4003.80	200.00	4,003.80	L/s	0.00	200.00	L/s		$ 295,432.00	7	METS Database
3	600-WB-01	600	WB	01	Water Bores	$ 641,000	-	$ 213,571.25	Local contractor	1.00	3.00	60.06	ea	0.00	1.00	ea	0.00	$ 213,571.25		
1	600-TP-01	600	TP	01	Bore Water Treatment Plant	$ 772,000	152.52	$ 771,743.14	Osmflo	107.21	107.21	2,146.14	m3/h	152.52	219.00	m3/h	234.13	$ 1,184,705.00	7	
1	600-TP-02	600	TP	02	RO Treatment Plant															METS Database
					Total for Area 600	**$ 35,055,000**	822.12													

APPENDIX G – OPEX

Appendix items

METS ENGINEERING
PROCESS + INNOVATION

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DOCUMENT COVER SHEET

CLIENT:	Cobre Limited
PROJECT TITLE:	Ngami Copper Project
PROJECT NO.:	J5945
DOCUMENT TITLE:	ISCR Project OPEX Estimation - Stage 1
DOCUMENT NO:	J5945-P-OP-000-001

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.			
CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH
	NAME	DATE	
OR			
CH			

Rev	Date	Revision	By	Ch'k	Appv.
1	14/10/24	Issued for Information	HM	MN	DC
0	27/09/24	Issued for Client Review	HM	MN	DC
C	26/09/24	Issued for Internal Review	HM	JB	DC
B	24/09/24	Issued for Internal Review	HM	MN	DC
A	9/09/24	Issued for Internal Review	HM	MN	DC

SOURCE CODES

The following codes are used to reference the criteria.

CODE	SOURCE
1	Client Supplied Data
2	METS Calculated/Estimated Value
3	METS Assumed Value
4	Market Specification
5	Testwork Result
6	Vendor Supplied Data
7	Other Sources

Notes

G & A and Offsite Costs include the following items:

1. Transport Costs/Food/Reagents
2. Medical Clinic Labour/Equipment/Medicines
3. Camp Management/Catering/ Housekeeping
4. Communications Leasing Costs
5. Camp Contractor

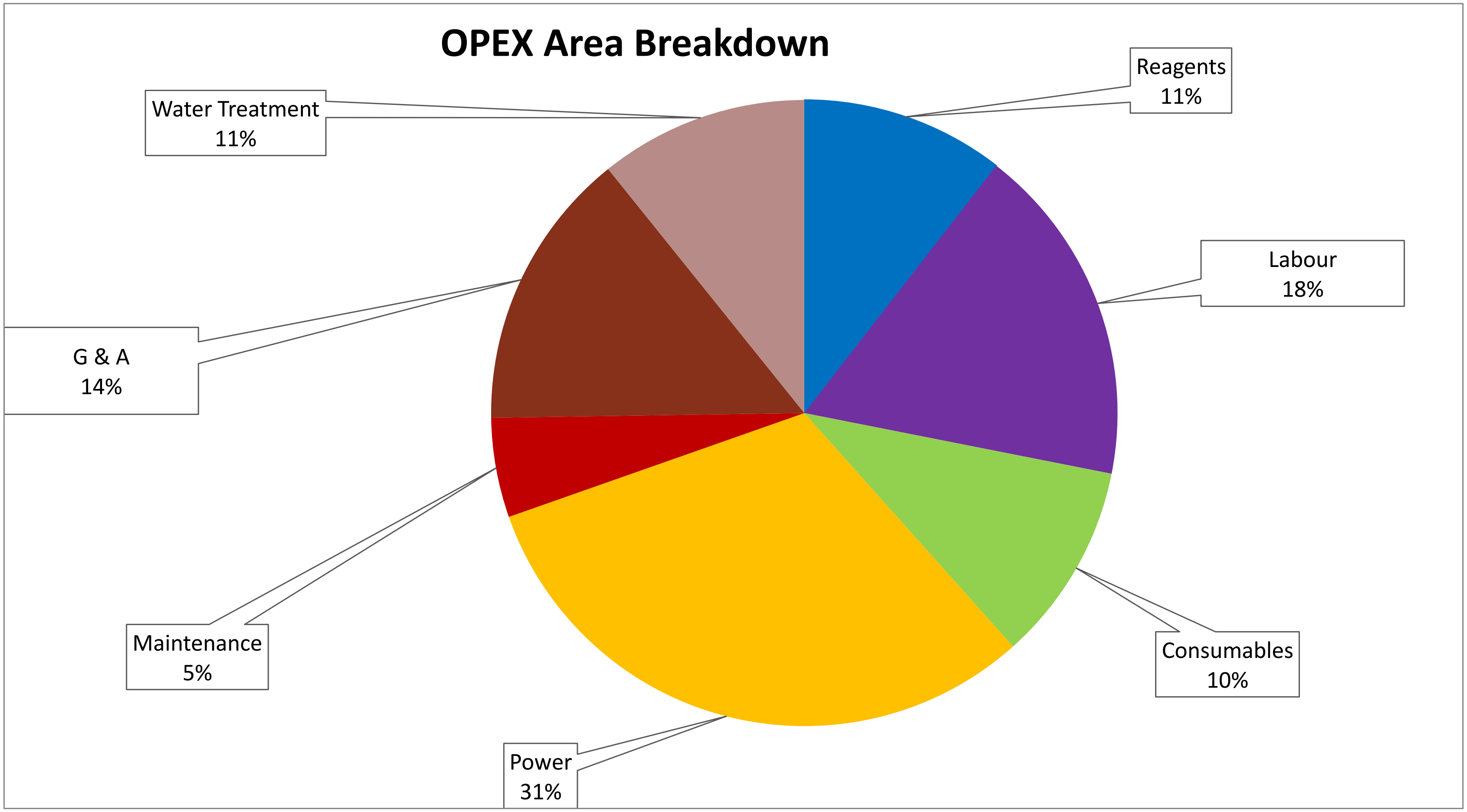
AREA	DESCRIPTION
100	In-Situ Well Field
200	Tank Farm and Ponds
300	Silver Precipitation
400	Solvent Extraction
500	Electrowinning
600	Site Infrastructure

ISCR Project OPEX Estimation - Stage 1	
Document No.:	**J5945-P-OP-000-001**
Project:	**Ngami Copper Project**
Client:	**Cobre Limited**
Option:	**Base Case**
Accuracy:	**± 50%**
Rev:	**1**

Key Inputs and Outputs		
Plant throughput	tpa	1,315,750
Copper Production	t/year	1,903
Annual operating hours		
In-Situ Well Field	hrs	7,884
Tank Farm and Ponds	hrs	8,760
Silver Precipitation	hrs	8,322
Solvent Extraction	hrs	8,585
Electrowinning	hrs	8,585
Site Infrastructure	hrs	8,322
CAPEX	**AUD**	**56,395,202**
Operating Cost Estimation AUD	**$18,561,960.89**	**AUD per annum**
	$9,754.32	**AUD per tonne of copper**
	$4.42	**AUD per lb of copper**
Operating Cost Estimation USD	**$12,068,895.25**	**USD per annum**
	$6,342.21	**USD per tonne of copper**
	$2.88	**USD per lb of copper**

Summary AUD	AUD/a	AUD/t of copper	AUD/lb of copper	USD/lb of copper
Reagents	$ 1,949,273.56	$ 1,024.34	$ 0.46	$ 0.30
Labour	$ 3,268,000.00	$ 1,717.34	$ 0.78	$ 0.51
Consumables	$ 1,909,113.15	$ 1,003.24	$ 0.46	$ 0.30
Power	$ 5,796,003.20	$ 3,045.80	$ 1.38	$ 0.90
Maintenance	$ 954,556.58	$ 501.62	$ 0.23	$ 0.15
G & A	$ 2,685,014.40	$ 1,410.98	$ 0.64	$ 0.42
Water Treatment	$ 2,000,000.00	$ 1,051.00	$ 0.48	$ 0.31
Total AUD	**$ 18,561,960.89**	**$ 9,754.32**	**$ 4.42**	**$ 2.88**

Summary - Total Cost	AUD/a	Fixed %	Fixed Cost AUD/a	Variable AUD/a
Reagents	$ 1,949,273.56	5%	$97,464	$1,851,810
Labour	$ 3,268,000.00	100%	$3,268,000	$0
Consumables	$ 1,909,113.15	0%	$0	$1,909,113
Power	$ 5,796,003.20	15%	$869,400	$4,926,603
Maintenance	$ 954,556.58	15%	$143,183	$811,373
G & A	$ 2,685,014.40	100%	$2,685,014	$0
Water Treatment	$ 2,000,000.00	100%	$2,000,000	$0
Total	**$ 18,561,960.89**	**66%**	**$9,063,062**	**$9,498,899**


OPEX Area Breakdown
Reagents
11%
Labour
18%
Consumables
10%
Power
31%
Maintenance
5%
G & A
14%
Water Treatment
11%

Document	ISCR Project OPEX Estimation - Stage 1
Area	Information & Assumptions
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Key Input	Units	Amount	Source of information
Annual Plant Throughput (tpa) - Nominal	tpa	1,315,750	PDC
Hours per year	h	8,760	PDC
Processing Plant Availability - Area 100 ISL Field	%	90%	PDC
Processing Plant Availability - Area 200 Tank Farm and Ponds	%	100%	Assumption
Processing Plant Availability - Area 300 Silver Recovery	%	90%	Assumption (Silver recovery)
Processing Plant Availability - Area 400 SX	%	98%	PDC
Processing Plant Availability - Area 500 EW	%	98%	PDC
Processing Plant Availability - Area 600 Infrastructure	%	95%	Assumption
Water Treatment Plant Availability	%	95%	PDC
Annual Operating Hours - Area 100 ISL Field	h	7,884	PDC
Annual Operating Hours - Area 200 Tank Farm and Ponds	h	8,760	PDC
Annual Operating Hours - Area 300 Silver Recovery	h	8,322	Assumption (Silver recovery)
Annual Operating Hours - Area 400 SX	h	8,585	PDC
Annual Operating Hours - Area 500 EW	h	8,585	PDC
Annual Operating Hours - Area 600 Infrastructure	h	8,322	PDC
Copper Feed Grade	%	0.40%	PDC
Total Copper in ore per year	tpa	5,263.00	Calculated
Overall Copper Recovery	%	36%	Calculated
Copper production per year	t/a	1,903	PDC
Copper production per year (lb)	lb/a	4,195,282	Calculated

Reagents Assumption	Units	Amount	Source of information
Sulfuric Acid	AUD/t	240.0	Earth Stone Chemical South Africa
Ferric Sulphate	AUD/t	430.0	Earth Stone Chemical South Africa
Sodium Carbonate	AUD/t	490.0	Earth Stone Chemical South Africa
Sodium Chloride	AUD/t	280.0	Earth Stone Chemical South Africa
Organic Solvent (Kerosene)	AUD/t	1400.0	Global Petrol Prices
Organic Extractant (M5774)	AUD/t	8000.0	Syensqo ACORGA M5774

Price List	Units	Price AUD/unit	Source of information
Currency Conversion USD to AUD	USD	$1.54	CAPEX
Currency Conversion Pula to AUD	BWP	$0.11	CAPEX
Power	kWh	$0.13	Assumption Botswana Power Corporation Mining Tarrif 1.1428 pula/kWh
Water	m^3	N/A	Plant to source water from water bores. Operating costs included in Diesel (Generators)
Flocculants	t	$4,000.00	METS Database
Natural gas	N/A	N/A	Excluded
Diesel	L	$1.84	Assumption Diesel price in Botswana
Operating Consumables	Percentage of equipment costs	10%	Assumption
Mobile Equipment Lease	Percentage of equipment costs	10%	Assumption
Maintenance Cost	Percentage of equipment costs	5%	Assumption
Equipment cost	AUD	**$19,091,132**	CAPEX
Total CAPEX AUD	AUD	**$56,395,202**	CAPEX
Total CAPEX USD	AUD	**$36,667,882**	CAPEX
Area 100 In-Situ Well Field Power	kW	**300.95**	CAPEX
Area 200 Tank Farm and Ponds Power	kW	**61.40**	CAPEX Assumption
Area 300 Silver Precipitation Power	kW	**131.50**	CAPEX
Area 400 Solvent Extraction Power	kW	**176.54**	CAPEX
Area 500 Electrowinning Power	kW	**1320.67**	CAPEX
Area 600 Site Infrastructure Power	kW	**288.52**	CAPEX Assumption

METS ENGINEERING
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Document	OPEX Estimation
Area	Labour
Client	Cobre Limited
Project	Kalahari Copper Belt Botswana Project
Job #	J5945
Doc #	J5945-P-OP-000-001

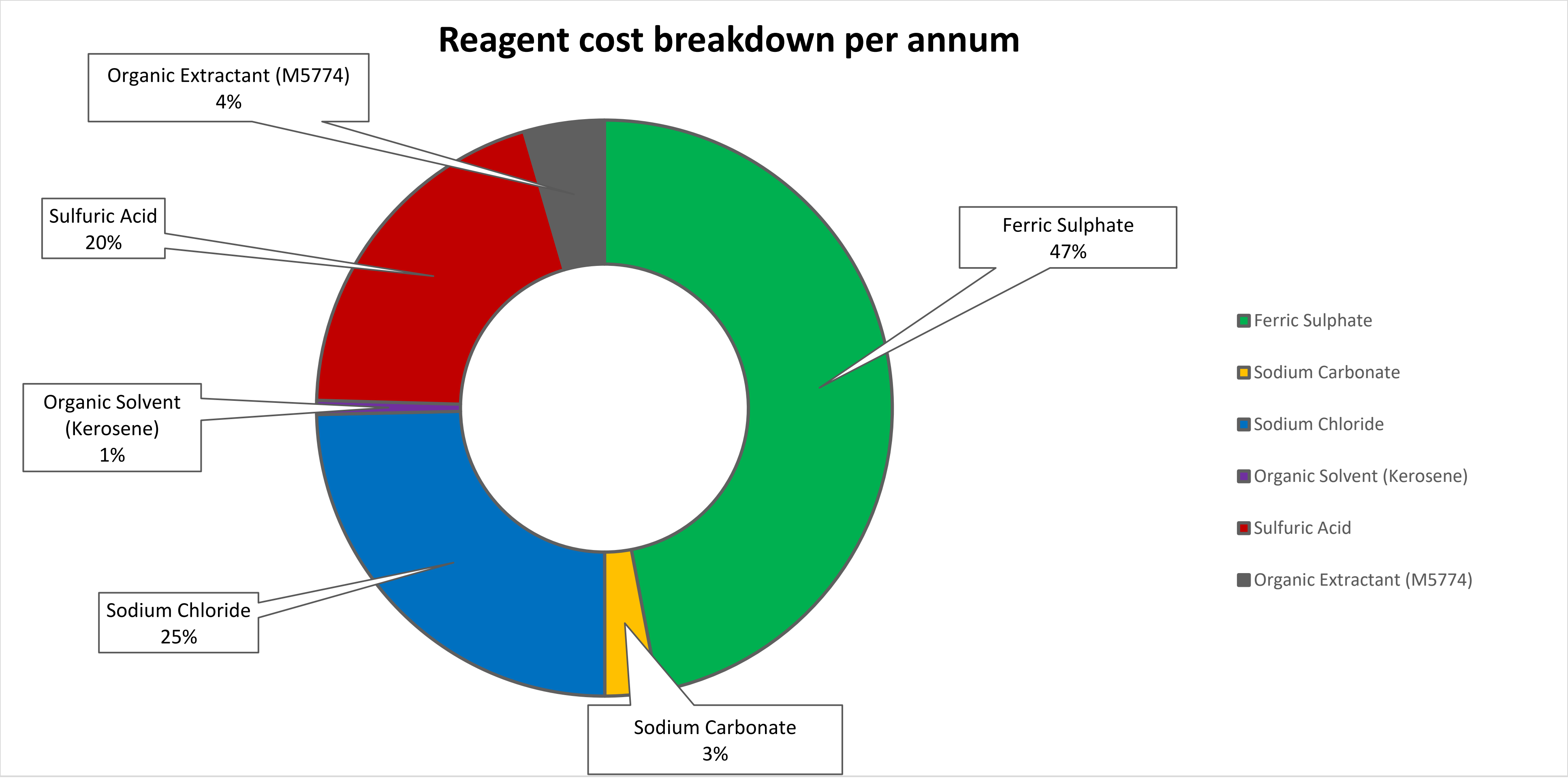
Personnel	Annual Base Salary (BWP/a)	Annual Base Salary (AUD/a)	Annual Adjusted Salary (AUD/a)	Adjustment Factor	Suggested Origin	Location	Roster	Shift (D or D/N)	No. of Person on Site per shift	Total No.	Salary with on top costs*(AUD/a)	Salary of staff (rounded)(AUD/a)	AUD/t of Copper	AUD/lb of Copper
General and Administration														
Operation Manager	BWP 2,880,000.00	$ 316,800.00	$ 513,216.00	1.62	Expat	Office/Site	8 days on, 6 days off	D	1	1	$ 692,841.60	$ 693,000.00	$364.17	$0.17
Administration Assistant	BWP 50,508.00	$ 5,555.88	$ 9,000.53	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 12,150.71	$ 13,000.00	$6.83	$0.00
Accountant	BWP 80,520.00	$ 8,857.20	$ 11,957.22	1.35	Local	Office	8 days on, 6 days off	D	1	2	$ 16,142.25	$ 33,000.00	$17.34	$0.01
Payroll Officer	BWP 72,000.00	$ 7,920.00	$ 10,692.00	1.35	Local	Office	8 days on, 6 days off	D	1	1	$ 14,434.20	$ 15,000.00	$7.88	$0.00
HR and Recruitment Officer	BWP 700,000.00	$ 77,000.00	$ 103,950.00	1.35	Expat	Office	5 days on, 2 days off	D	1	1	$ 140,332.50	$ 141,000.00	$74.10	$0.03
Training Superintendent	BWP 90,000.00	$ 9,900.00	$ 13,365.00	1.35	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 18,042.75	$ 19,000.00	$9.98	$0.00
Training Administrator	BWP 54,000.00	$ 5,940.00	$ 8,019.00	1.35	Local	Office/Site	5 days on, 2 days off	D	1	1	$ 10,825.65	$ 11,000.00	$5.78	$0.00
IT Manager	BWP 111,120.00	$ 12,223.20	$ 19,801.58	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 26,732.14	$ 27,000.00	$14.19	$0.01
IT Technician	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Office/Site	8 days on, 6 days off	D	1	2	$ 17,321.04	$ 35,000.00	$18.39	$0.01
Environment and Safety														
HSE Manager	BWP 96,000.00	$ 10,560.00	$ 17,107.20	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 23,094.72	$ 24,000.00	$12.61	$0.01
Safety Superintendent	BWP 90,000.00	$ 9,900.00	$ 16,038.00	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 21,651.30	$ 22,000.00	$11.56	$0.01
Environmental Superintendent	BWP 78,000.00	$ 8,580.00	$ 13,899.60	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 18,764.46	$ 19,000.00	$9.98	$0.00
Environmental Officer	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Office/Site	8 days on, 6 days off	D	1	2	$ 17,321.04	$ 35,000.00	$18.39	$0.01
Environmental Technician	BWP 54,000.00	$ 5,940.00	$ 9,622.80	1.62	Local	Site	8 days on, 6 days off	D	2	4	$ 12,990.78	$ 52,000.00	$27.33	$0.01
Logistics and Procurement														
Purchasing Manager	BWP 96,000.00	$ 10,560.00	$ 14,256.00	1.35	Local	Office	5 days on, 2 days off	D	1	1	$ 19,245.60	$ 20,000.00	$10.51	$0.00
Purchasing Assistant	BWP 60,000.00	$ 6,600.00	$ 8,910.00	1.35	Local	Office	5 days on, 2 days off	D	1	1	$ 12,028.50	$ 13,000.00	$6.83	$0.00
Logistics and Procurement Manager	BWP 90,000.00	$ 9,900.00	$ 16,038.00	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 21,651.30	$ 22,000.00	$11.56	$0.01
Logistics and Procurement Assistant	BWP 60,000.00	$ 6,600.00	$ 10,692.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 14,434.20	$ 15,000.00	$7.88	$0.00
Warehouse Supervisor	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 17,321.04	$ 18,000.00	$9.46	$0.00
Warehouse person	BWP 48,000.00	$ 5,280.00	$ 8,553.60	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 11,547.36	$ 47,000.00	$24.70	$0.01
Processing														
Process Plant Superintendent	BWP 1,800,000.00	$ 198,000.00	$ 320,760.00	1.62	Expat	Site	8 days on, 6 days off	D/N	1	1	$ 433,026.00	$ 434,000.00	$228.07	$0.10
Senior Plant Metallurgist	BWP 230,000.00	$ 25,300.00	$ 40,986.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 55,331.10	$ 56,000.00	$29.43	$0.01
Plant Metallurgist	BWP 160,000.00	$ 17,600.00	$ 28,512.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 38,491.20	$ 77,000.00	$40.46	$0.02
Plant Operator	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	3	6	$ 17,321.04	$ 104,000.00	$54.65	$0.02
Plant Fitter	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 15,877.62	$ 32,000.00	$16.82	$0.01
Plant Electrician	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 17,321.04	$ 35,000.00	$18.39	$0.01
Instrumentation Technician	BWP 78,000.00	$ 8,580.00	$ 13,899.60	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 18,764.46	$ 38,000.00	$19.97	$0.01
Laboratory Technician	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	3	6	$ 15,877.62	$ 96,000.00	$50.45	$0.02
Shift Supervisor	BWP 84,000.00	$ 9,240.00	$ 14,968.80	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 20,207.88	$ 41,000.00	$21.55	$0.01
Foreman	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 17,321.04	$ 35,000.00	$18.39	$0.01
Boiler Maker	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 15,877.62	$ 32,000.00	$16.82	$0.01
Trade Assistant	BWP 60,000.00	$ 6,600.00	$ 10,692.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 14,434.20	$ 29,000.00	$15.24	$0.01
Operator Maintainer	BWP 96,000.00	$ 10,560.00	$ 17,107.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 23,094.72	$ 47,000.00	$24.70	$0.01
ISCR Operation														
ISCR Operations Superintendent	BWP 1,800,000.00	$ 198,000.00	$ 320,760.00	1.62	Expat	Site	8 days on, 6 days off	D/N	1	1	$ 433,026.00	$ 434,000.00	$228.07	$0.10
ISCR Metallurgist	BWP 160,000.00	$ 17,600.00	$ 28,512.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 38,491.20	$ 39,000.00	$20.49	$0.01
Surveyor	BWP 78,000.00	$ 8,580.00	$ 13,899.60	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 18,764.46	$ 19,000.00	$9.98	$0.00
Drilling Engineer/Contractor	BWP 100,000.00	$ 11,000.00	$ 17,820.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 24,057.00	$ 25,000.00	$13.14	$0.01
Geologist	BWP 100,000.00	$ 11,000.00	$ 17,820.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 24,057.00	$ 25,000.00	$13.14	$0.01
Hydrologist	BWP 100,000.00	$ 11,000.00	$ 17,820.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 24,057.00	$ 25,000.00	$13.14	$0.01
ISCR Fitter	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 17,321.04	$ 35,000.00	$18.39	$0.01
ISCR Electrician	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 17,321.04	$ 35,000.00	$18.39	$0.01
ISCR Trade Assistant	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 17,321.04	$ 35,000.00	$18.39	$0.01
Leaching Technician	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 15,877.62	$ 64,000.00	$33.63	$0.02
Operator Maintainer	BWP 96,000.00	$ 10,560.00	$ 17,107.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 23,094.72	$ 47,000.00	$24.70	$0.01
Maintenance														
Maintenance Superintendent	BWP 96,000.00	$ 10,560.00	$ 17,107.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 23,094.72	$ 24,000.00	$12.61	$0.01
Maintenance Boilermarker/Fitter	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 15,877.62	$ 32,000.00	$16.82	$0.01
Maintenance Electrician	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 17,321.04	$ 35,000.00	$18.39	$0.01
Trade Assistant	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 15,877.62	$ 64,000.00	$33.63	$0.02
Total									**56**	**88**		**$ 3,268,000.00**	**$1,717.34**	**$0.78**

Notes							
Total on costs is 35%							
*On Costs							
Insurance		%					5.0%
Superannuation		%					11.0%
Holiday Pay		%					8.0%
Sick Pay		%					4.0%
Payroll Tax		%					7.0%
Total On Costs		%					35.0%
Adjustment Factor 1				Office	5:2 Roster		1.35
Adjustment Factor 2				Site	8:6 Roster		1.62

Document	OPEX Estimation
Area	Reagents
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Reagents	AUD /unit	Unit	Consumption (per annum)	Reagent Cost (AUD/a)	AUD/t of Copper	AUD/lb of Copper
Ferric Sulphate	$430.00	tonne	2,131	916,330	$481.53	$0.22
Sodium Carbonate	$490.00	tonne	118	57,899	$30.43	$0.01
Sodium Chloride	$280.00	tonne	1,717	480,749	$252.63	$0.11
Organic Solvent (Kerosene)	$1,400.00	tonne	11	15,400	$8.09	$0.00
Sulfuric Acid	$240.00	tonne	1,629	390,898	$205.42	$0.09
Organic Extractant (M5774)	$8,000.00	tonne	11	87,998	$46.24	$0.02
Total				**$1,949,274**	**$1,024.34**	**$0.46**

Note
1. Reagent cost is inclusive of 10% freight



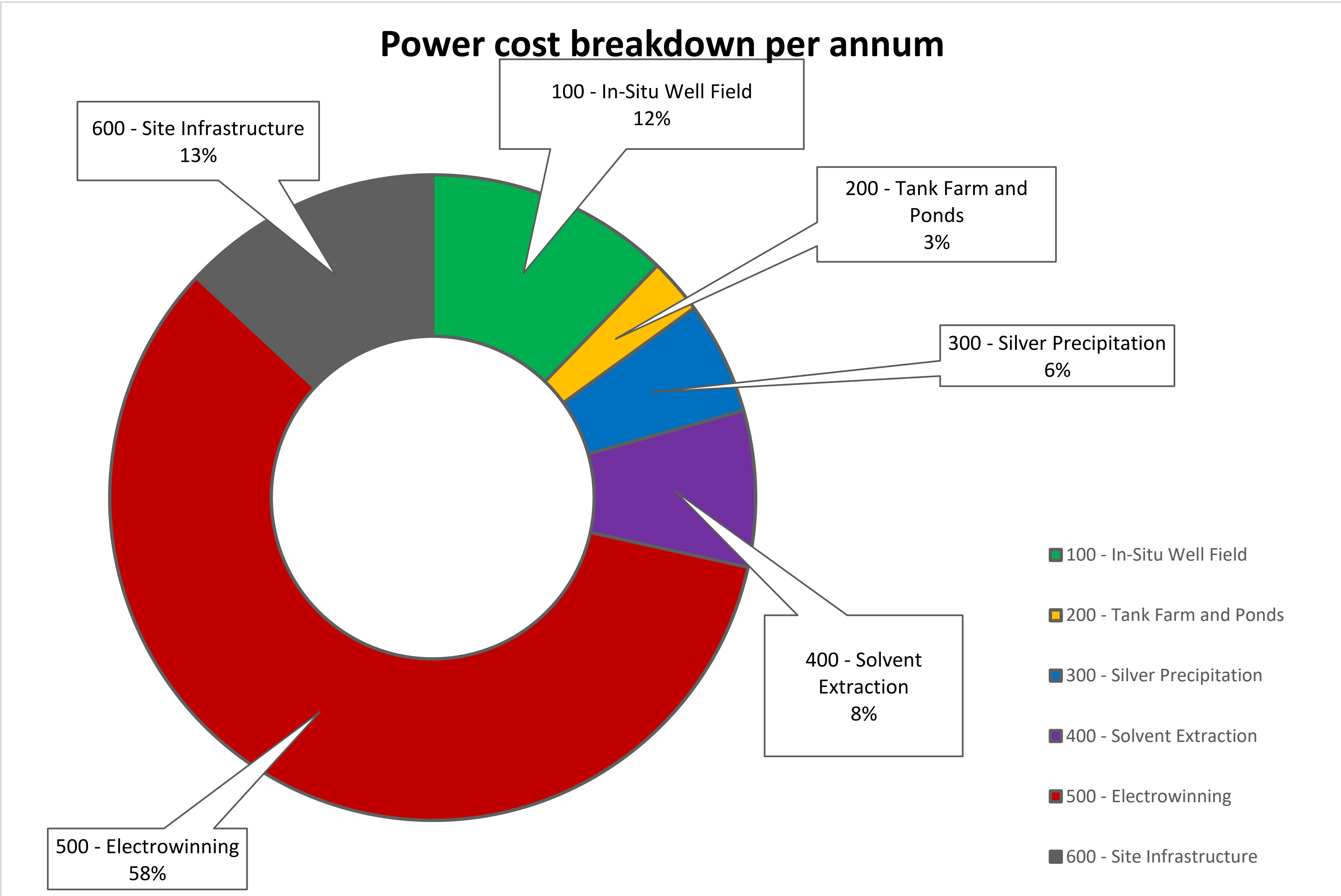
Document	OPEX Estimation
Area	Consumables
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Item Name	Percentage of equipment cost (%)	Consumables cost (AUD/a)	AUD/t of Copper	AUD/lb of Copper
Operating Consumables	10% of equipment cost	$1,909,113.15	$1,003.24	$0.46
Total		**$1,909,113**	**$1,003.24**	**$0.46**

Document	OPEX Estimation
Area	Power
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Area	Installed Power (kW)	Utilisation %	Load Factor %	Power Draw (kW)	Operating Hours (h/a)	Consumption (kWh/a)	Diesel Consumption Consumption (l/a)	Total Cost (AUD/a)	AUD/t of Copper	AUD/lb of Copper
100 - In-Situ Well Field	301	90	60	163	7,884	1,281,252	384,376	$709,143	$372.65	$0.17
200 - Tank Farm and Ponds	61	90	60	33	8,760	290,447	87,134	$160,755	$84.48	$0.04
300 - Silver Precipitation	132	90	60	71	8,322	590,945	177,284	$327,074	$171.88	$0.08
400 - Solvent Extraction	177	90	60	95	8,585	818,403	245,521	$452,966	$238.03	$0.11
500 - Electrowinning	1,321	90	60	713	8,585	6,122,351	1,836,705	$3,388,575	$1,780.70	$0.81
600 - Site Infrastructure	289	95	60	164	8,322	1,368,606	410,582	$757,491	$398.06	$0.18
Total	**2,280**			**1,240**		**10,472,005**	**3,141,601**	**$5,796,003.20**	**$3,045.80**	**$1.38**

*Note 1: Consumption 0.3 litre of Diesel per 1kWh


Power cost breakdown per annum
100 - In-Situ Well Field
12%
200 - Tank Farm and Ponds
3%
300 - Silver Precipitation
6%
400 - Solvent Extraction
8%
500 - Electrowinning
58%
600 - Site Infrastructure
13%
100 - In-Situ Well Field
200 - Tank Farm and Ponds
300 - Silver Precipitation
400 - Solvent Extraction
500 - Electrowinning
600 - Site Infrastructure

Document	OPEX Estimation
Area	Maintenance
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Area	Direct Cost (AUD)	Maintenance Cost (%)	Maintenance Cost per year (AUD)	AUD/t of Copper	AUD/lb of Copper
Plant / Site Maintenance	$19,091,132	5%	$954,557	$501.62	$0.23
Total	**$19,091,132**		**$954,557**	**$501.62**	**$0.23**

Document	OPEX Estimation	
Area	G & A	
Client	Cobre Limited	
Project	Ngami Copper Project	
Job #	J5945	
Doc #	J5945-P-OP-000-001	

No.	Description	Units	Rate	Direct Cost (AUD)	% Direct Cost (%)	Total Cost Annual (AUD)	AUD/t of Copper	AUD/lb of Copper
1	Medical Clinic Labour/Equipment/Medicines			$ 200,000.00	100%	$ 200,000.00	$ 105.10	$ 0.05
2	Camp Management/Catering/ Housekeeping			$ 1,385,014.40	100%	$ 1,385,014.40	$ 727.83	$ 0.33
3	Communications Costs			$ 200,000.00	100%	$ 200,000.00	$ 105.10	$ 0.05
4	Laboratory Costs			$ 200,000.00	100%	$ 200,000.00	$ 105.10	$ 0.05
5	Mobile Equipment Lease			$ 200,000.00	100%	$ 200,000.00	$ 105.10	$ 0.05
6	Security Contract			$ 500,000.00	100%	$ 500,000.00	$ 262.75	$ 0.12
	Total			**$2,685,014.40**		**$2,685,014.40**	**$1,410.98**	**$0.64**

1. Medical Clinic Labour/Equipment/Medicines costs assumed $200,000 p.a.
2. Camp Management/Catering/ Housekeeping costs assumed based on AU$80/person/day
3. Communication Costs assumed at $200,000 p.a
4. Laboratory cost assumed at $200,000 p.a.
5. Contingency for mobile equipment lease. Assumed fixed cost of $200,000 p.a.
6. Security requirements for the site and camp. Assumed fixed cost of $500,000 p.a.

Document	OPEX Estimation
Area	Water Treatment
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

No.	Description	Units	Rate	Direct Cost (AUD)	% Direct Cost (%)	Total Cost Annual (AUD)	AUD/t of Copper	AUD/lb of Copper
1	Water Treatment			$ 2,000,000.00	100%	$ 2,000,000.00	$ 1,051.00	$ 0.48
	Total			**$2,000,000.00**		**$2,000,000.00**	**$1,051.00**	**$0.48**

1. Water Treatement assumed to be $2 M/a based on similar ISL projects

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DOCUMENT COVER SHEET

CLIENT: Cobre Limited

PROJECT TITLE: Ngami Copper Project

PROJECT NO.: J5945

DOCUMENT TITLE: ISCR Project OPEX Estimation - Stage 2

DOCUMENT NO: J5945-P-OP-000-001

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.

CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH
	NAME	DATE	
OR			
CH			

Rev	Date	Revision	By	Ch'k	Appv.
2	14/10/24	Issued for Information	HM	MN	DC
1	9/10/24	Issued for Client Review	HM	MN	DC
0	27/09/24	Issued for Client Review	HM	MN	DC
C	26/09/24	Issued for Internal Review	HM	JB	DC
B	24/09/24	Issued for Internal Review	HM	MN	DC
A	9/09/24	Issued for Internal Review	HM	MN	DC

SOURCE CODES

The following codes are used to reference the criteria.

CODE	SOURCE
1	Client Supplied Data
2	METS Calculated/Estimated Value
3	METS Assumed Value
4	Market Specification
5	Testwork Result
6	Vendor Supplied Data
7	Other Sources

Notes

G & A and Offsite Costs include the following items:

1. Transport Costs/Food/Reagents
2. Medical Clinic Labour/Equipment/Medicines
3. Camp Management/Catering/ Housekeeping
4. Communications Leasing Costs
5. Camp Contractor

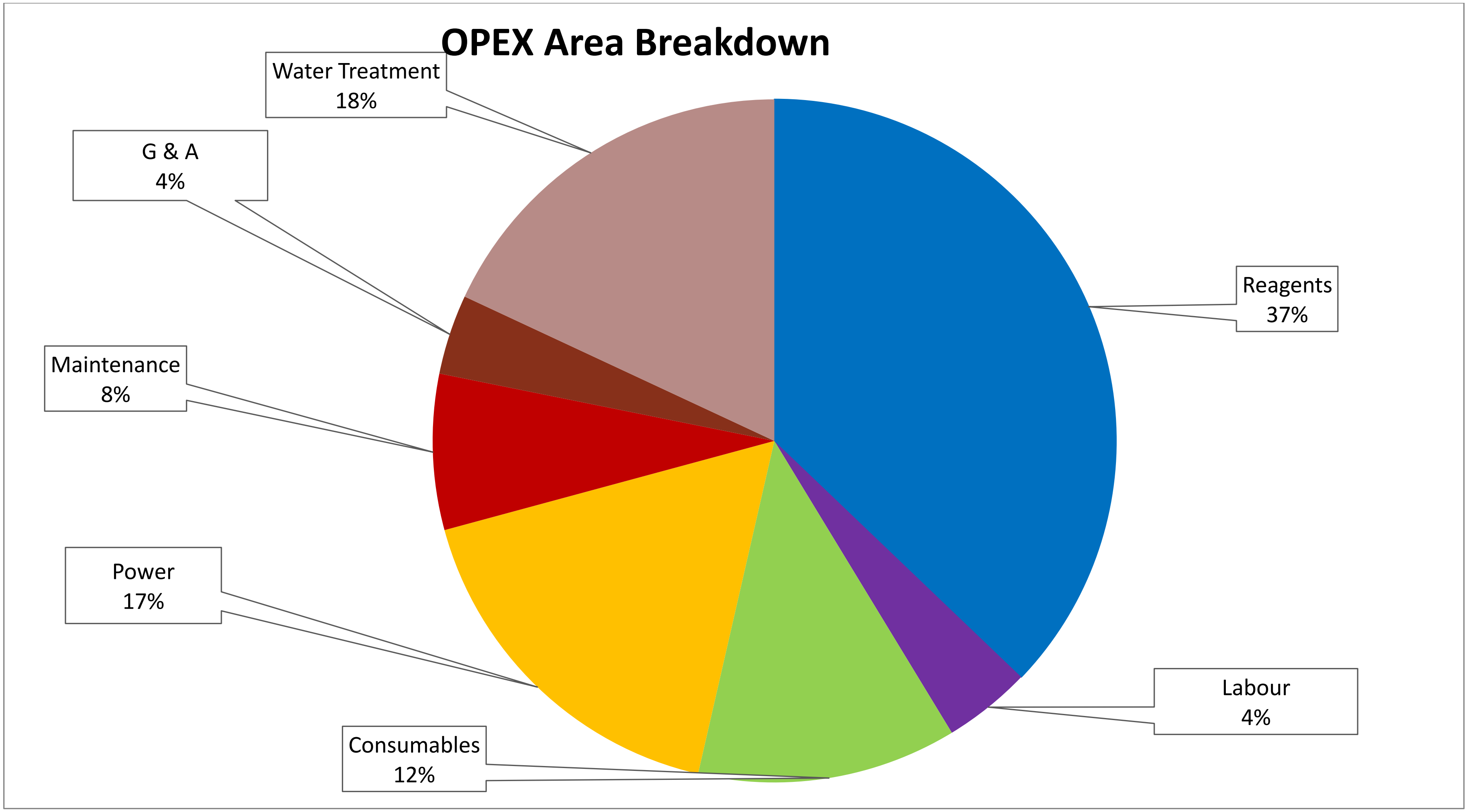
AREA	DESCRIPTION
100	In-Situ Well Field
200	Tank Farm and Ponds
300	Silver Precipitation
400	Solvent Extraction
500	Electrowinning
600	Site Infrastructure

ISCR Project OPEX Estimation - Stage 2	
Document No.:	**J5945-P-OP-000-001**
Project:	**Ngami Copper Project**
Client:	**Cobre Limited**
Option:	**Base Case**
Accuracy:	**± 50%**
Rev:	**2**

Key Inputs and Outputs		
Plant throughput	tpa	1,315,750
Copper Production	t/year	39,998
Annual operating hours		
In-Situ Well Field	hrs	7,884
Tank Farm and Ponds	hrs	8,760
Silver Precipitation	hrs	8,322
Solvent Extraction	hrs	8,585
Electrowinning	hrs	8,585
Site Infrastructure	hrs	8,322
CAPEX	**AUD**	**401,822,707**
Operating Cost Estimation AUD	**$110,767,640.68**	**AUD per annum**
	$2,769.33	**AUD per tonne of copper**
	$1.26	**AUD per lb of copper**
Operating Cost Estimation USD	**$72,020,572.61**	**USD per annum**
	$1,800.60	**USD per tonne of copper**
	$0.82	**USD per lb of copper**

Summary AUD	AUD/a	AUD/t of copper	AUD/lb of copper	USD/lb of copper
Reagents	$ 41,147,215.58	$ 1,028.73	$ 0.47	$ 0.30
Labour	$ 4,606,000.00	$ 115.16	$ 0.05	$ 0.03
Consumables	$ 13,602,664.41	$ 340.08	$ 0.15	$ 0.10
Power	$ 19,060,648.45	$ 476.54	$ 0.22	$ 0.14
Maintenance	$ 8,161,598.65	$ 204.05	$ 0.09	$ 0.06
G & A	$ 4,189,513.60	$ 104.74	$ 0.05	$ 0.03
Water Treatment	$ 20,000,000.00	$ 500.02	$ 0.23	$ 0.15
Total AUD	**$ 110,767,640.68**	**$ 2,769.33**	**$ 1.26**	**$ 0.82**

Summary - Total Cost	AUD/a	Fixed %	Fixed Cost AUD/a	Variable AUD/a
Reagents	$ 41,147,215.58	5%	$2,057,361	$39,089,855
Labour	$ 4,606,000.00	100%	$4,606,000	$0
Consumables	$ 13,602,664.41	0%	$0	$13,602,664
Power	$ 19,060,648.45	15%	$2,859,097	$16,201,551
Maintenance	$ 8,161,598.65	15%	$1,224,240	$6,937,359
G & A	$ 4,189,513.60	100%	$4,189,514	$0
Water Treatment	$ 20,000,000.00	100%	$20,000,000	$0
Total	**$ 110,767,640.68**	**12%**	**$34,936,211**	**$75,831,429**


OPEX Area Breakdown
Water Treatment
18%
G & A
4%
Reagents
37%
Maintenance
8%
Power
17%
Labour
4%
Consumables
12%

Document	ISCR Project OPEX Estimation - Stage 2
Area	Information & Assumptions
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Key Input	Units	Amount	Source of information
Annual Plant Throughput (tpa) - Nominal	tpa	1,315,750	PDC
Hours per year	h	8,760	PDC
Processing Plant Availability - Area 100 ISL Field	%	90%	PDC
Processing Plant Availability - Area 200 Tank Farm and Ponds	%	100%	Assumption
Processing Plant Availability - Area 300 Silver Recovery	%	90%	Assumption (Silver recovery)
Processing Plant Availability - Area 400 SX	%	98%	PDC
Processing Plant Availability - Area 500 EW	%	98%	PDC
Processing Plant Availability - Area 600 Infrastructure	%	95%	Assumption
Water Treatment Plant Availability	%	95%	PDC
Annual Operating Hours - Area 100 ISL Field	h	7,884	PDC
Annual Operating Hours - Area 200 Tank Farm and Ponds	h	8,760	PDC
Annual Operating Hours - Area 300 Silver Recovery	h	8,322	Assumption (Silver recovery)
Annual Operating Hours - Area 400 SX	h	8,585	PDC
Annual Operating Hours - Area 500 EW	h	8,585	PDC
Annual Operating Hours - Area 600 Infrastructure	h	8,322	PDC
Copper Feed Grade	%	0.40%	PDC
Total Copper in ore per year	tpa	5,263.00	Calculated
Overall Copper Recovery	%	36%	Calculated
Copper production per year	t/a	39,998	PDC
Copper production per year (lb)	lb/a	88,180,633	Calculated

Reagents Assumption	Units	Amount	Source of information
Sulfuric Acid	AUD/t	240.0	Earth Stone Chemical South Africa
Ferric Sulphate	AUD/t	430.0	Earth Stone Chemical South Africa
Sodium Carbonate	AUD/t	490.0	Earth Stone Chemical South Africa
Sodium Chloride	AUD/t	280.0	Earth Stone Chemical South Africa
Organic Solvent (Kerosene)	AUD/t	1400.0	Global Petrol Prices
Organic Extractant (M5774)	AUD/t	8000.0	Syensqo ACORGA M5774

Price List	Units	Price AUD/unit	Source of information
Currency Conversion USD to AUD	USD	$1.54	CAPEX
Currency Conversion Pula to AUD	BWP	$0.11	CAPEX
Power	kWh	$0.13	Assumption Botswana Power Corporation Mining Tarrif 1.1428 pula/kWh
Water	m^3	N/A	Plant to source water from water bores. Operating costs included in Diesel (Generators)
Flocculants	t	$4,000.00	METS Database
Natural gas	N/A	N/A	Excluded
Diesel	L	$1.84	Assumption Diesel price in Botswana
Operating Consumables	Percentage of equipment costs	10%	Assumption
Mobile Equipment Lease	Percentage of equipment costs	10%	Assumption
Maintenance Cost	Percentage of equipment costs	6%	Assumption
Equipment cost	AUD	**$136,026,644**	CAPEX
Total CAPEX AUD	AUD	**$401,822,707**	CAPEX
Total CAPEX USD	AUD	**$261,263,138**	CAPEX
Area 100 In-Situ Well Field Power	kW	**6489.26**	CAPEX
Area 200 Tank Farm and Ponds Power	kW	**340.86**	CAPEX
Area 300 Silver Precipitation Power	kW	**775.59**	CAPEX
Area 400 Solvent Extraction Power	kW	**1380.56**	CAPEX
Area 500 Electrowinning Power	kW	**14331.06**	CAPEX
Area 600 Site Infrastructure Power	kW	**1110.64**	CAPEX

Document	OPEX Estimation
Area	Labour
Client	Cobre Limited
Project	Kalahari Copper Belt Botswana Project
Job #	J5945
Doc #	J5945-P-OP-000-001

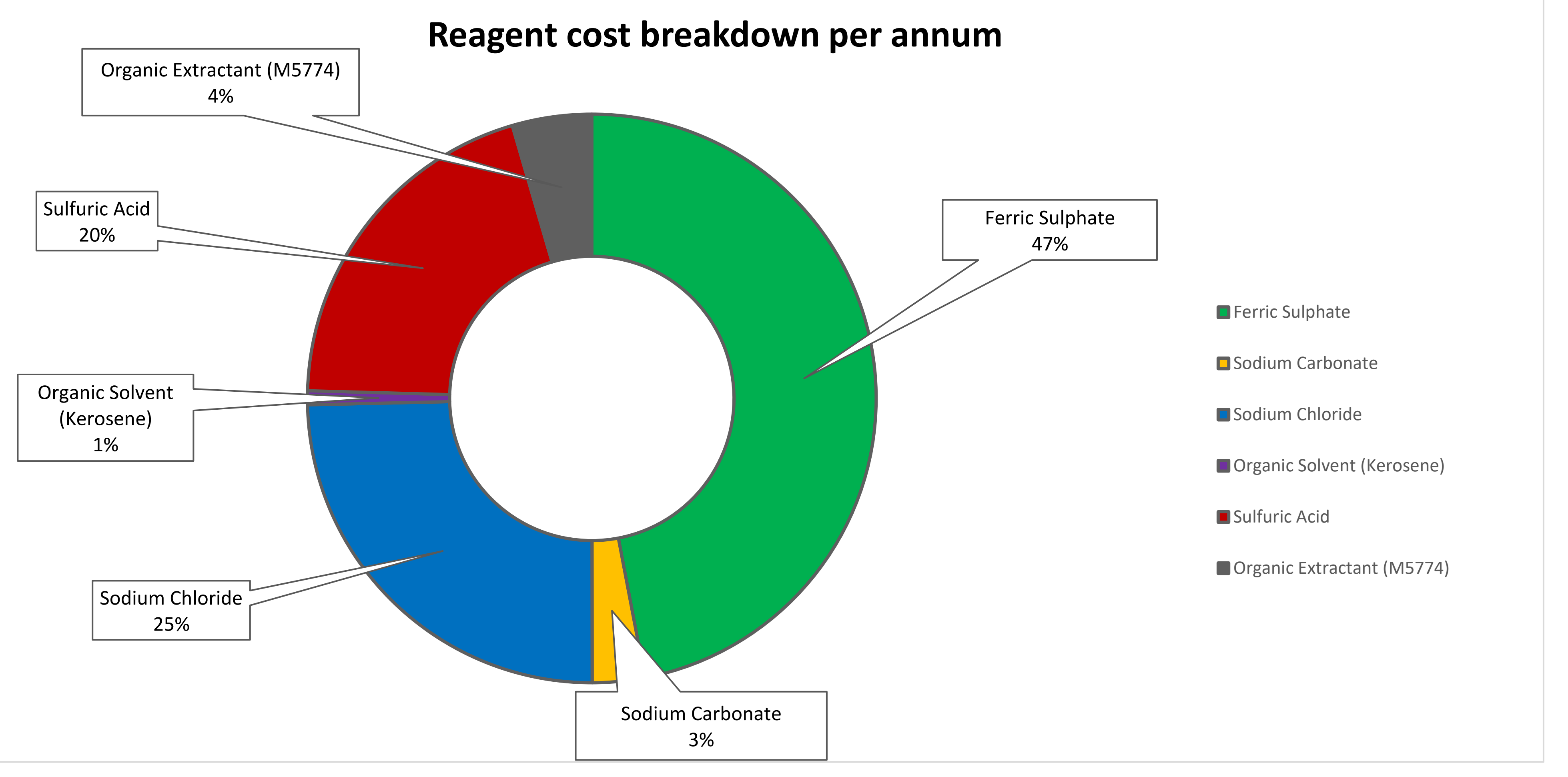
Personnel	Annual Base Salary (BWP/a)	Annual Base Salary (AUD/a)	Annual Adjusted Salary (AUD/a)	Adjustment Factor	Suggested Origin	Location	Roster	Shift (D or D/N)	No. of Person on Site per shift	Total No.	Salary with on top costs*(AUD/a)	Salary of staff (rounded)(AUD/a)	AUD/t of Copper	AUD/lb of Copper
General and Administration														
Operation Manager	BWP 2,880,000.00	$ 316,800.00	$ 513,216.00	1.62	Expat	Office/Site	8 days on, 6 days off	D	1	1	$ 692,841.60	$ 693,000.00	$17.33	$0.01
Administration Assistant	BWP 50,508.00	$ 5,555.88	$ 9,000.53	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 12,150.71	$ 13,000.00	$0.33	$0.00
Accountant	BWP 80,520.00	$ 8,857.20	$ 11,957.22	1.35	Local	Office	8 days on, 6 days off	D	1	2	$ 16,142.25	$ 33,000.00	$0.83	$0.00
Payroll Officer	BWP 72,000.00	$ 7,920.00	$ 10,692.00	1.35	Local	Office	8 days on, 6 days off	D	1	1	$ 14,434.20	$ 15,000.00	$0.38	$0.00
HR and Recruitment Officer	BWP 700,000.00	$ 77,000.00	$ 103,950.00	1.35	Expat	Office	5 days on, 2 days off	D	1	1	$ 140,332.50	$ 141,000.00	$3.53	$0.00
Training Superintendent	BWP 90,000.00	$ 9,900.00	$ 13,365.00	1.35	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 18,042.75	$ 19,000.00	$0.48	$0.00
Training Administrator	BWP 54,000.00	$ 5,940.00	$ 8,019.00	1.35	Local	Office/Site	5 days on, 2 days off	D	1	1	$ 10,825.65	$ 11,000.00	$0.28	$0.00
IT Manager	BWP 111,120.00	$ 12,223.20	$ 19,801.58	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 26,732.14	$ 27,000.00	$0.68	$0.00
IT Technician	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Office/Site	8 days on, 6 days off	D	1	2	$ 17,321.04	$ 35,000.00	$0.88	$0.00
Environment and Safety														
HSE Manager	BWP 96,000.00	$ 10,560.00	$ 17,107.20	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 23,094.72	$ 24,000.00	$0.60	$0.00
Safety Superintendent	BWP 90,000.00	$ 9,900.00	$ 16,038.00	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 21,651.30	$ 22,000.00	$0.55	$0.00
Environmental Superintendent	BWP 78,000.00	$ 8,580.00	$ 13,899.60	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 18,764.46	$ 19,000.00	$0.48	$0.00
Environmental Officer	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Office/Site	8 days on, 6 days off	D	1	2	$ 17,321.04	$ 35,000.00	$0.88	$0.00
Environmental Technician	BWP 54,000.00	$ 5,940.00	$ 9,622.80	1.62	Local	Site	8 days on, 6 days off	D	2	4	$ 12,990.78	$ 52,000.00	$1.30	$0.00
Logistics and Procurement														
Purchasing Manager	BWP 96,000.00	$ 10,560.00	$ 14,256.00	1.35	Local	Office	5 days on, 2 days off	D	1	1	$ 19,245.60	$ 20,000.00	$0.50	$0.00
Purchasing Assistant	BWP 60,000.00	$ 6,600.00	$ 8,910.00	1.35	Local	Office	5 days on, 2 days off	D	1	1	$ 12,028.50	$ 13,000.00	$0.33	$0.00
Logistics and Procurement Manager	BWP 90,000.00	$ 9,900.00	$ 16,038.00	1.62	Local	Office/Site	8 days on, 6 days off	D	1	1	$ 21,651.30	$ 22,000.00	$0.55	$0.00
Logistics and Procurement Assistant	BWP 60,000.00	$ 6,600.00	$ 10,692.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 14,434.20	$ 15,000.00	$0.38	$0.00
Warehouse Supervisor	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 17,321.04	$ 18,000.00	$0.45	$0.00
Warehouse person	BWP 48,000.00	$ 5,280.00	$ 8,553.60	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 11,547.36	$ 47,000.00	$1.18	$0.00
Processing														
Process Plant Superintendent	BWP 1,800,000.00	$ 198,000.00	$ 320,760.00	1.62	Expat	Site	8 days on, 6 days off	D/N	2	2	$ 433,026.00	$ 867,000.00	$21.68	$0.01
Senior Plant Metallurgist	BWP 230,000.00	$ 25,300.00	$ 40,986.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 55,331.10	$ 56,000.00	$1.40	$0.00
Plant Metallurgist	BWP 160,000.00	$ 17,600.00	$ 28,512.00	1.62	Local	Site	8 days on, 6 days off	D/N	2	2	$ 38,491.20	$ 77,000.00	$1.93	$0.00
Plant Operator	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	3	6	$ 17,321.04	$ 104,000.00	$2.60	$0.00
Plant Fitter	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 15,877.62	$ 32,000.00	$0.80	$0.00
Plant Electrician	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 17,321.04	$ 35,000.00	$0.88	$0.00
Instrumentation Technician	BWP 78,000.00	$ 8,580.00	$ 13,899.60	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 18,764.46	$ 38,000.00	$0.95	$0.00
Laboratory Technician	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	3	6	$ 15,877.62	$ 96,000.00	$2.40	$0.00
Shift Supervisor	BWP 84,000.00	$ 9,240.00	$ 14,968.80	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 20,207.88	$ 41,000.00	$1.03	$0.00
Foreman	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 17,321.04	$ 35,000.00	$0.88	$0.00
Boiler Maker	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 15,877.62	$ 32,000.00	$0.80	$0.00
Trade Assistant	BWP 60,000.00	$ 6,600.00	$ 10,692.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 14,434.20	$ 29,000.00	$0.73	$0.00
Operator Maintainer	BWP 96,000.00	$ 10,560.00	$ 17,107.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 23,094.72	$ 47,000.00	$1.18	$0.00
ISCR Operation														
ISCR Operations Superintendent	BWP 1,800,000.00	$ 198,000.00	$ 320,760.00	1.62	Expat	Site	8 days on, 6 days off	D/N	2	2	$ 433,026.00	$ 867,000.00	$21.68	$0.01
ISCR Metallurgist	BWP 160,000.00	$ 17,600.00	$ 28,512.00	1.62	Local	Site	8 days on, 6 days off	D/N	2	2	$ 38,491.20	$ 77,000.00	$1.93	$0.00
Surveyor	BWP 78,000.00	$ 8,580.00	$ 13,899.60	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 18,764.46	$ 19,000.00	$0.48	$0.00
Drilling Engineer/Contractor	BWP 100,000.00	$ 11,000.00	$ 17,820.00	1.62	Local	Site	8 days on, 6 days off	D/N	1	2	$ 24,057.00	$ 49,000.00	$1.23	$0.00
Geologist	BWP 100,000.00	$ 11,000.00	$ 17,820.00	1.62	Local	Site	8 days on, 6 days off	D/N	2	3	$ 24,057.00	$ 73,000.00	$1.83	$0.00
Hydrologist	BWP 100,000.00	$ 11,000.00	$ 17,820.00	1.62	Local	Site	8 days on, 6 days off	D/N	2	3	$ 24,057.00	$ 73,000.00	$1.83	$0.00
ISCR Fitter	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 17,321.04	$ 70,000.00	$1.75	$0.00
ISCR Electrician	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 17,321.04	$ 70,000.00	$1.75	$0.00
ISCR Trade Assistant	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 17,321.04	$ 70,000.00	$1.75	$0.00
Leaching Technician	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	4	6	$ 15,877.62	$ 96,000.00	$2.40	$0.00
Operator Maintainer	BWP 96,000.00	$ 10,560.00	$ 17,107.20	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 23,094.72	$ 93,000.00	$2.33	$0.00
Maintenance														
Maintenance Superintendent	BWP 96,000.00	$ 10,560.00	$ 17,107.20	1.62	Local	Site	8 days on, 6 days off	D/N	1	1	$ 23,094.72	$ 24,000.00	$0.60	$0.00
Maintenance Boilermarker/Fitter	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 15,877.62	$ 64,000.00	$1.60	$0.00
Maintenance Electrician	BWP 72,000.00	$ 7,920.00	$ 12,830.40	1.62	Local	Site	8 days on, 6 days off	D/N	2	4	$ 17,321.04	$ 70,000.00	$1.75	$0.00
Trade Assistant	BWP 66,000.00	$ 7,260.00	$ 11,761.20	1.62	Local	Site	8 days on, 6 days off	D/N	4	8	$ 15,877.62	$ 128,000.00	$3.20	$0.00
Total									**72**	**114**		**$ 4,606,000.00**	**$115.16**	**$0.05**

Notes							
Total on costs is 35%							
*On Costs							
Insurance		%					5.0%
Superannuation		%					11.0%
Holiday Pay		%					8.0%
Sick Pay		%					4.0%
Payroll Tax		%					7.0%
Total On Costs		%					35.0%
Adjustment Factor 1				Office	5:2 Roster		1.35
Adjustment Factor 2				Site	8:6 Roster		1.62

Document	OPEX Estimation
Area	Reagents
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Reagents	AUD /unit	Unit	Consumption (per annum)	Reagent Cost (AUD/a)	AUD/t of Copper	AUD/lb of Copper
Ferric Sulphate	$430.00	tonne	44,983	19,342,818	$483.59	$0.22
Sodium Carbonate	$490.00	tonne	2,494	1,222,191	$30.56	$0.01
Sodium Chloride	$280.00	tonne	36,243	10,148,126	$253.72	$0.12
Organic Solvent (Kerosene)	$1,400.00	tonne	232	325,070	$8.13	$0.00
Sulfuric Acid	$240.00	tonne	34,381	8,251,466	$206.30	$0.09
Organic Extractant (M5774)	$8,000.00	tonne	232	1,857,544	$46.44	$0.02
Total				**$41,147,216**	**$1,028.73**	**$0.47**

Note
1. Reagent cost is inclusive of 10% freight

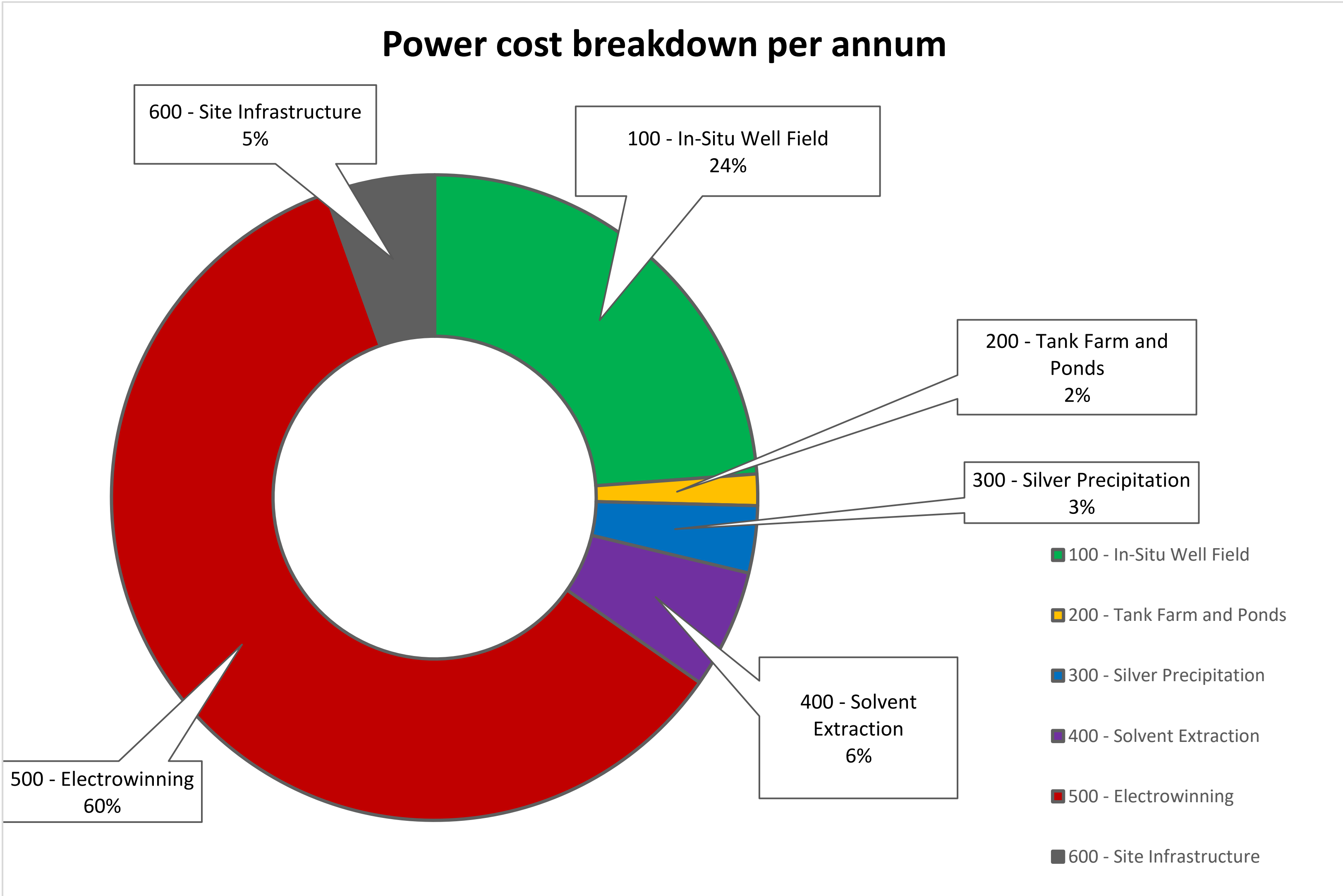


Document	OPEX Estimation
Area	Consumables
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Item Name	Percentage of equipment cost (%)	Consumables cost (AUD/a)	AUD/t of Copper	AUD/lb of Copper
Operating Consumables	10% of equipment cost	$13,602,664.41	$340.08	$0.15
Total		**$13,602,664**	**$340.08**	**$0.15**

Document	OPEX Estimation
Area	Power
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Area	Installed Power (kW)	Utilisation %	Load Factor %	Power Draw (kW)	Operating Hours (h/a)	Consumption (kWh/a)	Total Cost (AUD/a)	AUD/t of Copper	AUD/lb of Copper
100 - In-Situ Well Field	6,790	90	75	4,583	7,884	36,135,461	$4,542,516	$113.57	$0.05
200 - Tank Farm and Ponds	402	90	75	272	8,760	2,378,563	$299,004	$7.48	$0.00
300 - Silver Precipitation	907	90	75	612	8,322	5,095,442	$640,538	$16.01	$0.01
400 - Solvent Extraction	1,557	90	75	1,051	8,585	9,022,990	$1,134,262	$28.36	$0.01
500 - Electrowinning	15,652	90	75	10,565	8,585	90,697,706	$11,401,427	$285.05	$0.13
600 - Site Infrastructure	1,399	95	75	997	8,322	8,296,214	$1,042,901	$26.07	$0.01
Total	**26,708**			**18,080**		**151,626,376**	**$19,060,648.45**	**$476.54**	**$0.22**


Power cost breakdown per annum
600 - Site Infrastructure 5%
100 - In-Situ Well Field 24%
200 - Tank Farm and Ponds 2%
300 - Silver Precipitation 3%
400 - Solvent Extraction 6%
500 - Electrowinning 60%
100 - In-Situ Well Field
200 - Tank Farm and Ponds
300 - Silver Precipitation
400 - Solvent Extraction
500 - Electrowinning
600 - Site Infrastructure

Document	OPEX Estimation
Area	Maintenance
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

Area	Direct Cost (AUD)	Maintenance Cost (%)	Maintenance Cost per year (AUD)	AUD/t of Copper	AUD/lb of Copper
Plant / Site Maintenance	$136,026,644	6%	$8,161,599	$204.05	$0.09
Total	**$136,026,644**		**$8,161,599**	**$204.05**	**$0.09**

Document	OPEX Estimation	
Area	G & A	
Client	Cobre Limited	
Project	Ngami Copper Project	
Job #	J5945	
Doc #	J5945-P-OP-000-001	

No.	Description	Units	Rate	Direct Cost (AUD)	% Direct Cost (%)	Total Cost Annual (AUD)	AUD/t of Copper	AUD/lb of Copper
1	Medical Clinic Labour/Equipment/Medicines			$ 200,000.00	100%	$ 200,000.00	$ 5.00	$ 0.00
2	Camp Management/Catering/ Housekeeping			$ 2,289,513.60	100%	$ 2,289,513.60	$ 57.24	$ 0.03
3	Communications Costs			$ 400,000.00	100%	$ 400,000.00	$ 10.00	$ 0.00
4	Laboratory Costs			$ 400,000.00	100%	$ 400,000.00	$ 10.00	$ 0.00
5	Mobile Equipment Lease			$ 400,000.00	100%	$ 400,000.00	$ 10.00	$ 0.00
6	Security Contract			$ 500,000.00	100%	$ 500,000.00	$ 12.50	$ 0.01
	Total			**$4,189,513.60**		**$4,189,513.60**	**$104.74**	**$0.05**

1. Medical Clinic Labour/Equipment/Medicines costs assumed $200,000 p.a.
2. Camp Management/Catering/ Housekeeping costs assumed based on AU$80/person/day
3. Communication Costs assumed at $400,000 p.a
4. Laboratory cost assumed at $400,000 p.a.
5. Contingency for mobile equipment lease. Assumed fixed cost of $400,000 p.a.
6. Security requirements for the site and camp. Assumed fixed cost of $500,000 p.a.

Document	OPEX Estimation
Area	Water Treatment
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-P-OP-000-001

No.	Description	Units	Rate	Direct Cost (AUD)	% Direct Cost (%)	Total Cost Annual (AUD)	AUD/t of Copper	AUD/lb of Copper
1	Water Treatment			$ 20,000,000.00	100%	$ 20,000,000.00	$ 500.02	$ 0.23
	Total			**$20,000,000.00**		**$20,000,000.00**	**$500.02**	**$0.23**

1. Water Treatement assumed to be $20 M/a based on similar ISL projects

APPENDIX H – Financial Model

Appendix items

METS ENGINEERING
PROCESS + INNOVATION

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S12, L3, 44 Parliament Place, West Perth 6005

DOCUMENT COVER SHEET

CLIENT:	Cobre Limited
PROJECT TITLE:	Ngami Copper Project
PROJECT NO:	J5945
DOCUMENT TITLE:	Financial Model
DOCUMENT NO:	J5945-ES-FM-001

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.		
CHECKING METHOD	CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO	OR	CH
NAME	DATE	
OR		
CH		

Rev	Date	Revision	By	Ch'k	Appv.
3	14/10/24	Issued for Information	HM	MN	DC
2	10/10/24	Issued for Client Review	HM	MN	DC
1	9/10/24	Issued for Client Review	HM	MN	DC
0	27/09/24	Issued for Client Review	HM	MN	DC
C	27/09/24	Issued for Internal Review	HM	JB	DC
B	20/09/24	Issued for Internal Review	HM	MN	DC
A	13/09/24	Issued for Internal Review	HM	MN	DC

Document	Financial Model
Area	Australia and Botswana
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-ES-FM-001
Rev	**3**

Assumptions

1 Currency used for modelling is AUD

2 Commodity prices

Commodity	Unit	Price	Source	Comments
Cu	AUD/tonne	$ 14,594.58	Assumed an average price of $6.62/lb based on 3 years historical data	Refer to Scoping Study report Marketing chapter
Ag	AUD/tonne	$ 1,629,658.80	Assumed an average price of 46.2/oz based on 3 years historical data	Refer to Scoping Study report Marketing chapter
CuSO4	AUD/tonne	$ 3,465.00	Assumed an average price of 3465/t based on 3 years historical data	Refer to Scoping Study report Marketing chapter

3 Capital and Operating costs provided by METS

4 Owner costs are considered in CAPEX model

5 IRR and NPV calculated pre-tax

6 Sustaining capital 4%

7 Resource under leach per year is 1,315,750 tonnes during Stage 1 and 27,655,749 tonnes during Stage 2.

8 Wellfield capital to establish next production field captured $1,334,000 per year starting in year 2 under Wellfield Expansion Capital.

9 Wellfield capital to establish next production field captured $26,834,000 per year starting in year 5 under Wellfield Expansion Capital.

10 Additional wellfield cost operating additional production field captured as $644,124 starting in year 2 under Wellfield Maintenance.

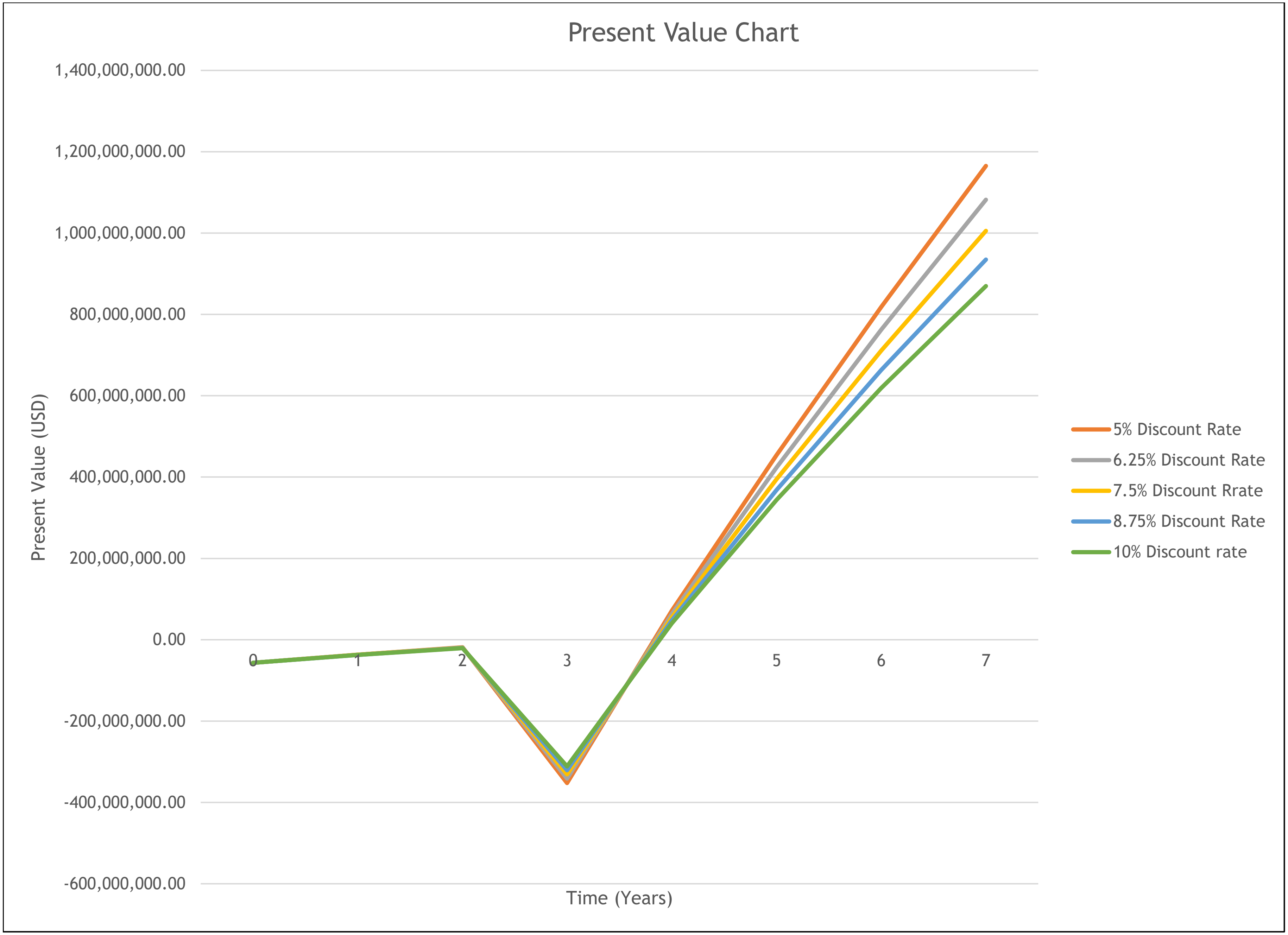
11 Additional wellfield cost operating additional production field captured as $13,526,619 starting in year 4 under Wellfield Maintenance.

12 Resource Grade assumed constant for base case

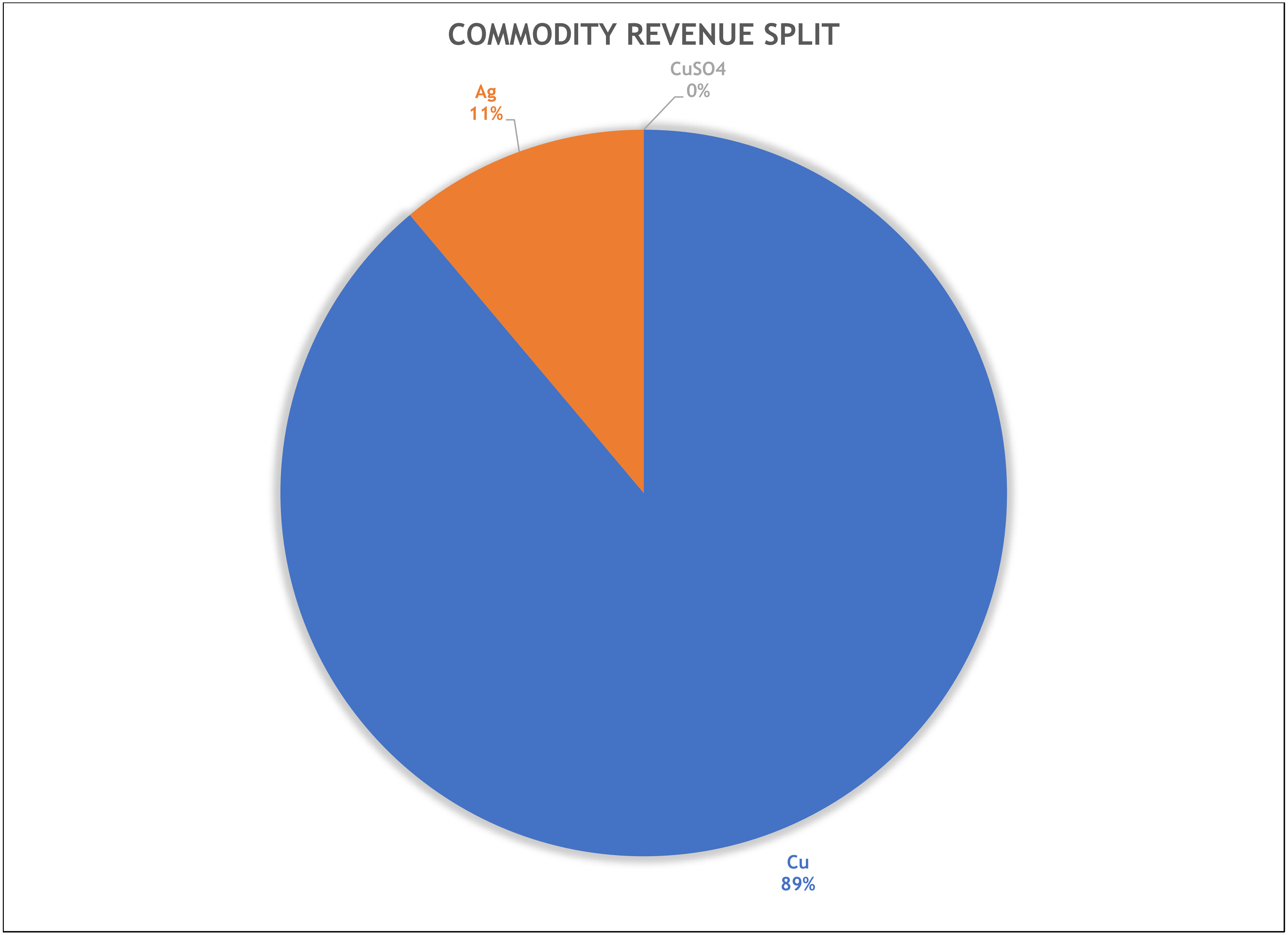
13 Recovery assumed constant for base case

14 Stage 2a and Stage 2b are based on different resource classification. Assumed resource is leachable within wellfield at this level of study.

	Unit	Stage 1 Value	Stage 2a Value	Stage 2b Value	0	1	2	3	4	5	6	7
					Costs over mine life							
Resource												
Total resource	tonnes	2,803,150	20,557,976	111,327,149	2,803,150.00	1,487,400.00	171,650.00	19,413,876.00	103,085,275.75	75,429,526.50	47,773,777.25	20,118,028.00
Resource Leached	tonnes	1,315,750	27,655,749	27,655,749		1,315,750.00	1,315,750.00	1,315,750.00	27,655,749.25	27,655,749.25	27,655,749.25	27,655,749.25
Contained Copper	tonnes	16,539	100,734	445,309	16,538.59	13,731.74	10,924.89	109,327.86	514,638.40	474,640.35	434,642.29	394,644.24
Contained Silver	tonnes	33	150	802	32.88	29.73	26.58	174.29	935.23	894.61	853.99	813.36
Annual Cu production	tonnes/year	1,903	39,998	39,998	0.00	2,806.85	2,806.85	2,331.11	39,998.06	39,998.06	39,998.06	39,998.06
Annual Ag Production	tonnes/year	2	39	39	0.00	3.15	3.15	1.95	40.62	40.62	40.62	40.62
Grade		Average grade	Average grade	Average grade								
Cu	%	0.59%	0.49%	0.40%	0.00%	0.59%	0.59%	0.49%	0.40%	0.40%	0.40%	0.40%
Ag	g/t	11.73	7.28	7.20	0	11.73	11.73	7.28	7.20	7.20	7.20	7.20
Feed Content												
Cu	tonnes/year				0.00	7,762.93	7,762.93	6,447.18	110,623.00	110,623.00	110,623.00	110,623.00
Ag	kg/year				0	15,434	15,434	9,579	199,121	199,121	199,121	199,121
Product												
Recovery												
Cu	%	36.2%	36.2%	36.2%	0.00	36%	36%	36%	36%	36%	36%	36%
Ag		20.4%	20.4%	20.4%	0.00	20%	20%	20%	20%	20%	20%	20%
Quantities of product												
Cu	tonnes/year	100%	100%	100%	0.00	2,806.85	2,806.85	2,331.11	39,998.06	39,998.06	39,998.06	39,998.06
Ag	kg/year	100.0%	100.0%	100.0%	0.00	3148.48	3148.48	1954.05	40620.76	40620.76	40620.76	40620.76
CuSO4	tonnes/year	0.0%	0.0%	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sales												
Commodity price												
Cu	AUD/tonne	AUD/tonne	AUD/tonne	$ 14,594.58								
Ag		AUD/tonne	AUD/tonne	$ 1,629,658.80								
CuSO4		AUD/tonne	AUD/tonne	$ 3,465.00								
Commodity sold												
Cu	tonnes/year	100%	100%	100%	0.00	2,806.85	2,806.85	2,331.11	39,998.06	39,998.06	39,998.06	39,998.06
Ag	kg/year	100%	100%	100%	0.00	3,148.48	3,148.48	1,954.05	40,620.76	40,620.76	40,620.76	40,620.76
CuSO4	tonnes/year	100%	100%	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Revenue												
Cu	AUD/year				$ -	$ 40,964,775.56	$ 40,964,775.56	$ 34,021,593.26	$ 583,754,994.87	$ 583,754,994.87	$ 583,754,994.87	$ 583,754,994.87
Ag					$ -	$ 5,130,955.46	$ 5,130,955.46	$ 3,184,429.30	$ 66,197,986.33	$ 66,197,986.33	$ 66,197,986.33	$ 66,197,986.33
CuSO4					$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total revenue					$ -	$ 46,095,731.01	$ 46,095,731.01	$ 37,206,022.56	$ 649,952,981.19	$ 649,952,981.19	$ 649,952,981.19	$ 649,952,981.19
Development												
Capital Cost	AUD	$ 56,395,202.45	$ 401,822,706.64	$ 401,822,706.64	56,395,202.45			401,822,706.64				
Wellfield Expansion Capital		$ 1,334,000.00	$ 26,834,000.00	$ 26,834,000.00	$ -	$ 1,334,000.00	$ 1,334,000.00	$ 1,334,000.00		$ 26,834,000.00	$ 26,834,000.00	$ 26,834,000.00
Total costs		$ 57,729,202.45	$ 428,656,706.64	$ 428,656,706.64	$ 56,395,202.45	$ 1,334,000.00	$ 1,334,000.00	$ 403,156,706.64	$ -	$ 26,834,000.00	$ 26,834,000.00	$ 26,834,000.00
Operating costs												
Reagents	$/t of Cu	1,024.34	1,028.73	1,028.73	$ -	$ 2,875,178.50	$ 2,875,178.50	$ 2,387,860.11	$ 41,147,215.58	$ 41,147,215.58	$ 41,147,215.58	$ 41,147,215.58
Labour	$/t of Cu	1,717.34	115.16	115.16	$ -	$ 4,820,300.00	$ 4,820,300.00	$ 4,003,300.00	$ 4,606,000.00	$ 4,606,000.00	$ 4,606,000.00	$ 4,606,000.00
Consumables	$/t of Cu	1,003.24	340.08	340.08	$ -	$ 2,815,941.90	$ 2,815,941.90	$ 2,338,663.61	$ 13,602,664.41	$ 13,602,664.41	$ 13,602,664.41	$ 13,602,664.41
Power	$/t of Cu	3,045.80	476.54	476.54	$ -	$ 2,815,941.90	$ 2,815,941.90	$ 2,338,663.61	$ 13,602,664.41	$ 13,602,664.41	$ 13,602,664.41	$ 13,602,664.41
Maintenance	$/t of Cu	501.62	204.05	204.05	$ -	$ 1,407,970.95	$ 1,407,970.95	$ 1,169,331.80	$ 8,161,598.65	$ 8,161,598.65	$ 8,161,598.65	$ 8,161,598.65
G & A and Offsite	$/t of Cu	1,410.98	104.74	104.74	$ -	$ 3,960,396.24	$ 3,960,396.24	$ 3,289,142.64	$ 4,189,513.60	$ 4,189,513.60	$ 4,189,513.60	$ 4,189,513.60
Water Treatment	$/t of Cu	1,051.00	500.02	500.02	$ -	$ 2,950,000.00	$ 2,950,000.00	$ 2,450,000.00	$ 20,000,000.00	$ 20,000,000.00	$ 20,000,000.00	$ 20,000,000.00
Wellfield Maintance							$ 644,124.73	$ 644,124.73	$ 13,526,619.40	$ 13,526,619.40	$ 13,526,619.40	$ 13,526,619.40
Sustaining Capital		4%	4%	4%		$ 2,255,808.10	$ 2,255,808.10	$ 2,255,808.10	$ 16,072,908.27	$ 16,072,908.27	$ 16,072,908.27	$ 16,072,908.27
Total costs	**AUD/year**				**$ -**	**$ 23,901,537.58**	**$ 24,545,662.31**	**$ 20,876,894.60**	**$ 134,909,184.30**	**$ 134,909,184.30**	**$ 134,909,184.30**	**$ 134,909,184.30**
Cash rates												
Cash flow	AUD/year				-$ 56,395,202.45	$ 20,860,193.43	$ 20,216,068.70	-$ 386,827,578.68	$ 515,043,796.89	$ 488,209,796.89	$ 488,209,796.89	$ 488,209,796.89
Cummulative cash flow	AUD				-$ 56,395,202.45	-$ 35,535,009.02	-$ 15,318,940.32	-$ 402,146,519.00	$ 112,897,277.89	$ 601,107,074.78	$ 1,089,316,871.68	$ 1,577,526,668.57
Financial indicators												
				Disc. Rate %								
Present value												
	AUD	5.00%	5.00%	5.00%	-$ 56,395,202.45	$ 19,866,850.89	$ 18,336,570.25	-$ 334,156,206.62	$ 423,727,806.33	$ 382,525,150.59	$ 364,309,667.23	$ 346,961,587.84
	AUD	6.25%	6.25%	6.25%	-$ 56,395,202.45	$ 19,633,123.23	$ 17,907,659.47	-$ 322,500,664.01	$ 404,136,807.19	$ 360,546,925.49	$ 339,338,282.81	$ 319,377,207.36
	AUD	7.50%	7.50%	7.50%	-$ 56,395,202.45	$ 19,404,831.10	$ 17,493,623.54	-$ 311,380,948.04	$ 385,665,067.97	$ 340,066,748.42	$ 316,341,161.32	$ 294,270,847.74
	AUD	8.75%	8.75%	8.75%	-$ 56,395,202.45	$ 19,181,787.06	$ 17,093,782.49	-$ 300,766,618.05	$ 368,236,724.20	$ 320,966,836.67	$ 295,141,918.77	$ 271,394,867.84
	AUD	10.00%	10.00%	10.00%	-$ 56,395,202.45	$ 18,963,812.21	$ 16,707,494.79	-$ 290,629,285.26	$ 351,781,843.38	$ 303,139,873.02	$ 275,581,702.74	$ 250,528,820.68
Cummulative discounted												
	AUD	5.00%	5.00%	5.00%	-$ 56,395,202.45	-$ 36,528,351.56	-$ 18,191,781.31	-$ 352,347,987.93	$ 71,379,818.40	$ 453,904,968.99	$ 818,214,636.22	$ 1,165,176,224.06
	AUD	6.25%	6.25%	6.25%	-$ 56,395,202.45	-$ 36,762,079.22	-$ 18,854,419.75	-$ 341,355,083.76	$ 62,781,723.43	$ 423,328,648.92	$ 762,666,931.73	$ 1,082,044,139.09
	AUD	7.50%	7.50%	7.50%	-$ 56,395,202.45	-$ 36,990,371.35	-$ 19,496,747.81	-$ 330,877,695.85	$ 54,787,372.12	$ 394,854,120.54	$ 711,195,281.87	$ 1,005,466,129.61
	AUD	8.75%	8.75%	8.75%	-$ 56,395,202.45	-$ 37,213,415.39	-$ 20,119,632.89	-$ 320,886,250.95	$ 47,350,473.25	$ 368,317,309.92	$ 663,459,228.69	$ 934,854,096.53
	AUD	10.00%	10.00%	10.00%	-$ 56,395,202.45	-$ 37,431,390.24	-$ 20,723,895.45	-$ 311,353,180.71	$ 40,428,662.67	$ 343,568,535.69	$ 619,150,238.43	$ 869,679,059.11
Pre tax												
Net Present Value												
	AUD	5.00%	5.00%	5.00%	$ 1,165,176,224.06							
	AUD	6.25%	6.25%	6.25%	$ 1,082,044,139.09							
	AUD	7.50%	7.50%	7.50%	$ 1,005,466,129.61							
	AUD	8.75%	8.75%	8.75%	$ 934,854,096.53							
	AUD	10.00%	10.00%	10.00%	$ 869,679,059.11							
Internal Rate of Return	%				75.7%							
Payback period - Stage 1	years				0.56							
Payback period - Stage 2	years				1.27				vices			



Present Value Chart
1,400,000,000.00
1,200,000,000.00
1,000,000,000.00
800,000,000.00
600,000,000.00
400,000,000.00
200,000,000.00
0.00
-200,000,000.00
-400,000,000.00
-600,000,000.00
Present Value (USD)
0
1
2
3
4
5
6
7
Time (Years)
5% Discount Rate
6.25% Discount Rate
7.5% Discount Rrate
8.75% Discount Rate
10% Discount rate


COMMODITY REVENUE SPLIT
CuSO4
0%
Ag
11%
Cu
89%

Document	CAPEX Estimate
Area	Australia and KSA
Client	Cobre Limited
Project	Ngami Copper Project
Job #	J5945
Doc #	J5945-ES-FM-001
Rev	3

Project value

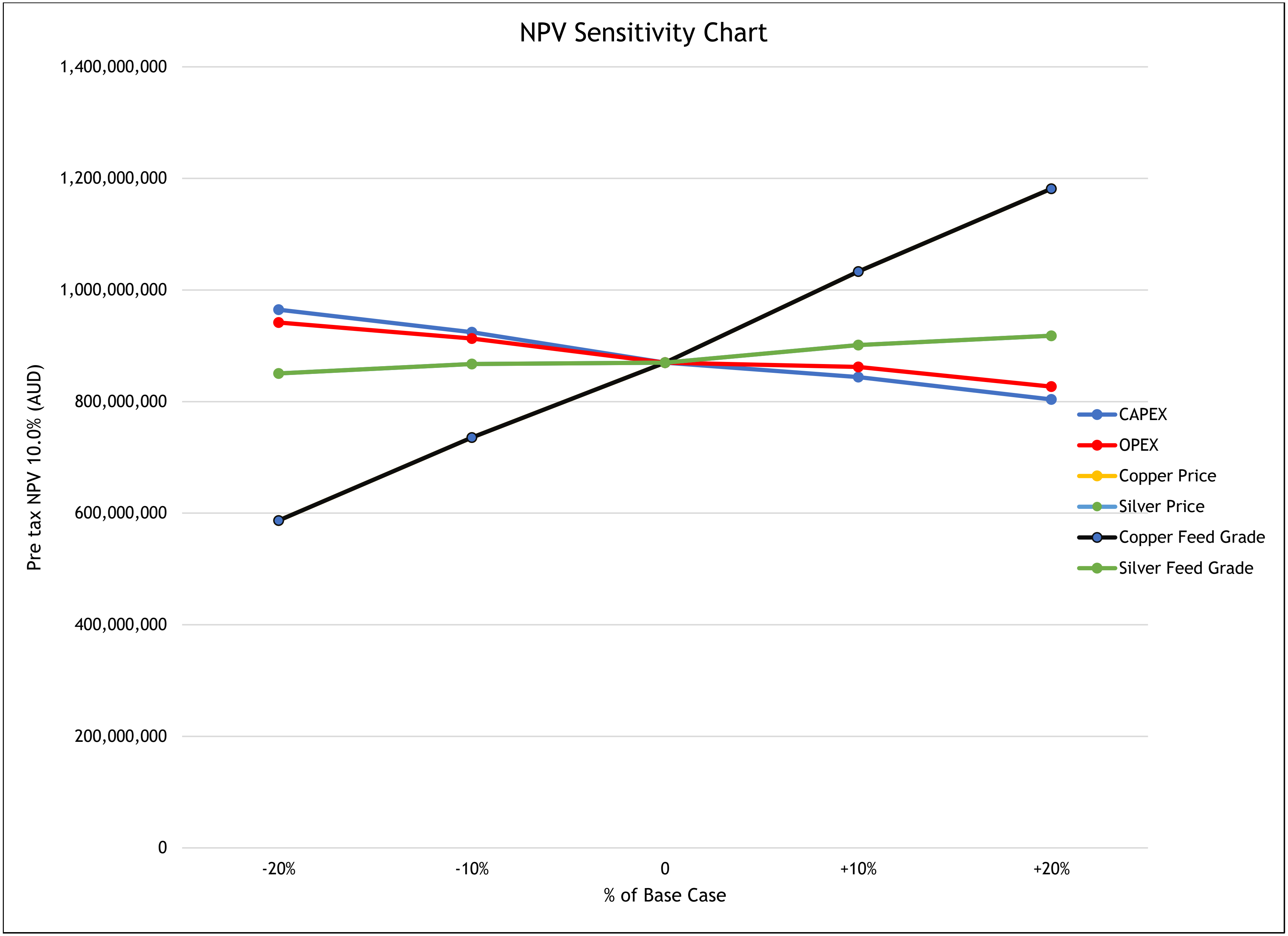
Base Case NPV	$ 869,679,059.11			**Discount rate**	10.0%
	NPV @ 10.0% Discount rate (EBIT)				
Scenario	-20%	-10%	0	+10%	+20%
CAPEX	$ 964,693,479.02	$ 924,475,567.49	$ 869,679,059.11	$ 844,039,744.43	$ 803,821,832.90
OPEX	$ 941,716,998.74	$ 912,987,327.35	$ 869,679,059.11	$ 862,155,872.73	$ 826,798,313.18
Copper Price	$ 586,875,986.21	$ 735,566,821.09	$ 869,679,059.11	$ 1,032,948,490.83	$ 1,181,639,325.71
Silver Price	$ 850,467,175.74	$ 867,362,415.85	$ 869,679,059.11	$ 901,152,896.07	$ 918,048,136.18
Copper Feed Grade	$ 586,875,986.21	$ 735,566,821.09	$ 869,679,059.11	$ 1,032,948,490.83	$ 1,181,639,325.71
Silver Feed Grade	$ 850,467,175.74	$ 867,362,415.85	$ 869,679,059.11	$ 901,152,896.07	$ 918,048,136.18

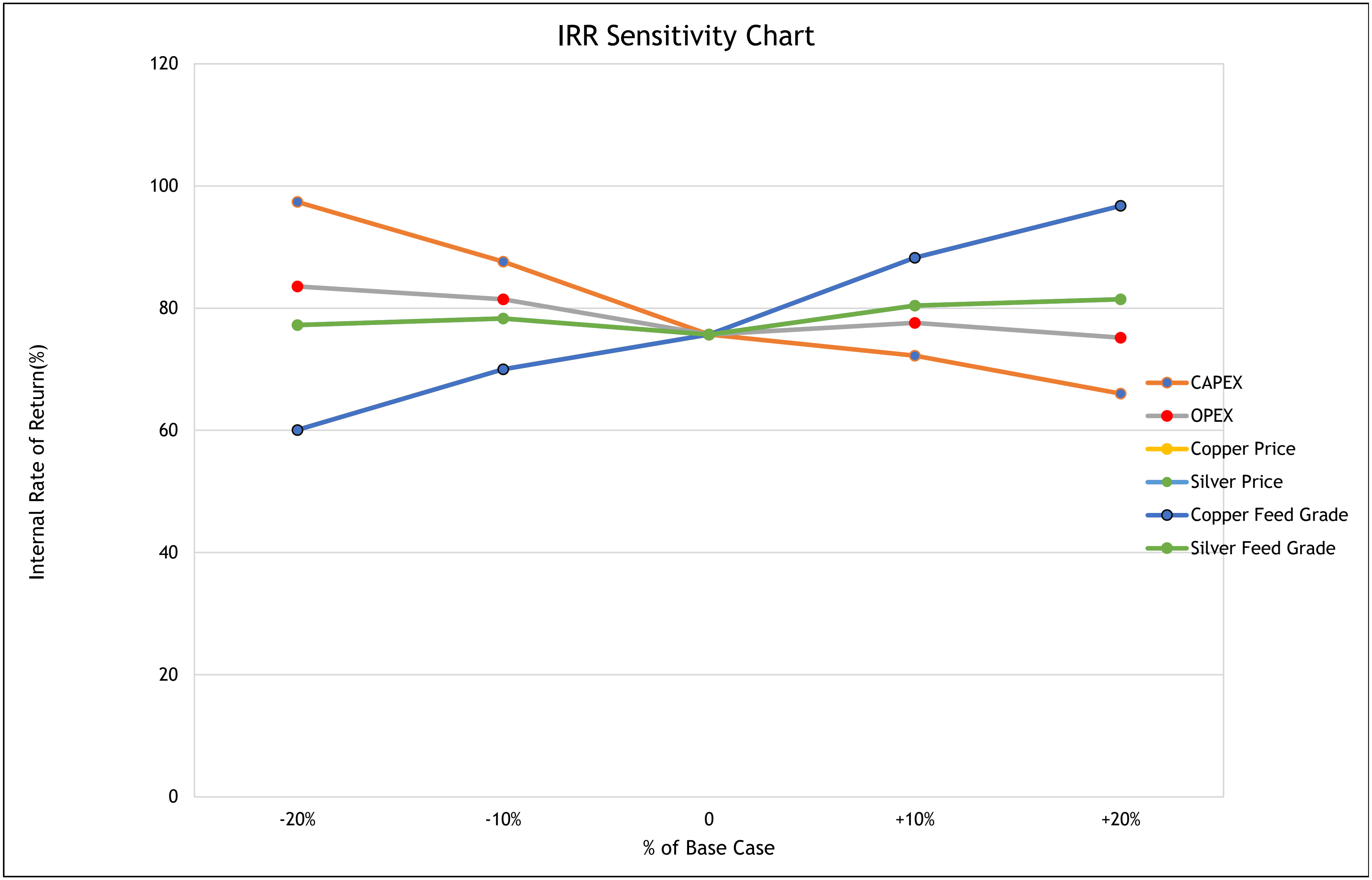
Payback time

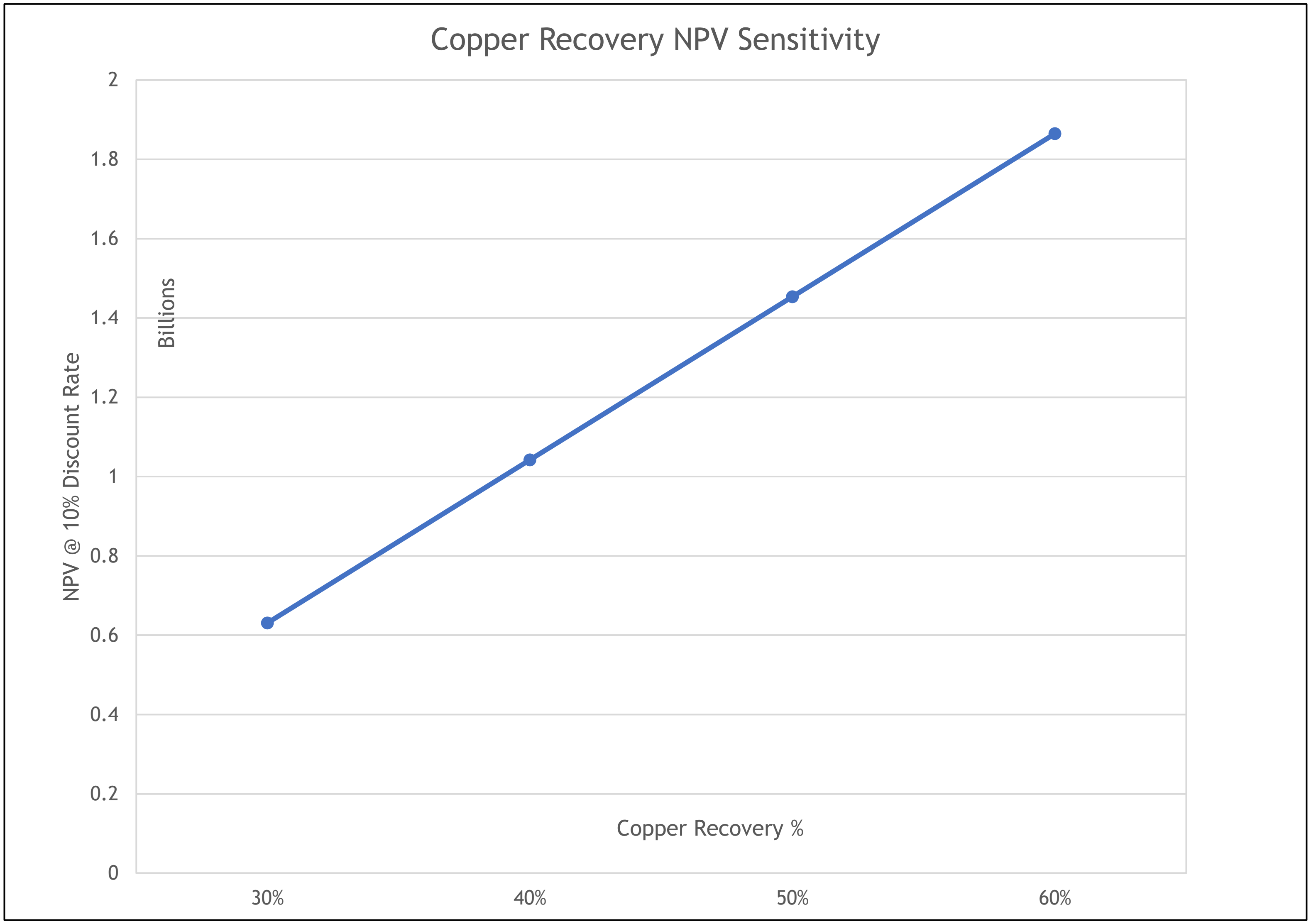
Base Case NPV	$ 869,679,059.11			**Discount rate**	10.0%
	Payback period - Stage 1				
Scenario	-20%	-10%	0	+10%	+20%
CAPEX	0.38	0.46	0.56	0.65	0.78
OPEX	0.51	0.53	0.56	0.57	0.60
Copper Price	0.94	0.69	0.56	0.45	0.39
Silver Price	0.57	0.56	0.56	0.53	0.52
Copper Feed Grade	0.94	0.69	0.56	0.45	0.39
Silver Feed Grade	0.57	0.56	0.56	0.53	0.52

Internal Rate of Return	IRR% SENSITIVITY					
	Scenario	-20%	-10%	0	+10%	+20%
	CAPEX	97.4	87.6	75.7	72.2	66.0
	OPEX	83.6	81.5	75.7	77.6	75.2
	Copper Price	60.1	70.0	75.7	88.2	96.8
	Silver Price	77.3	78.3	75.7	80.4	81.5
	Copper Feed Grade	60.1	70.0	75.7	88.2	96.8
	Silver Feed Grade	77.3	78.3	75.7	80.4	81.5

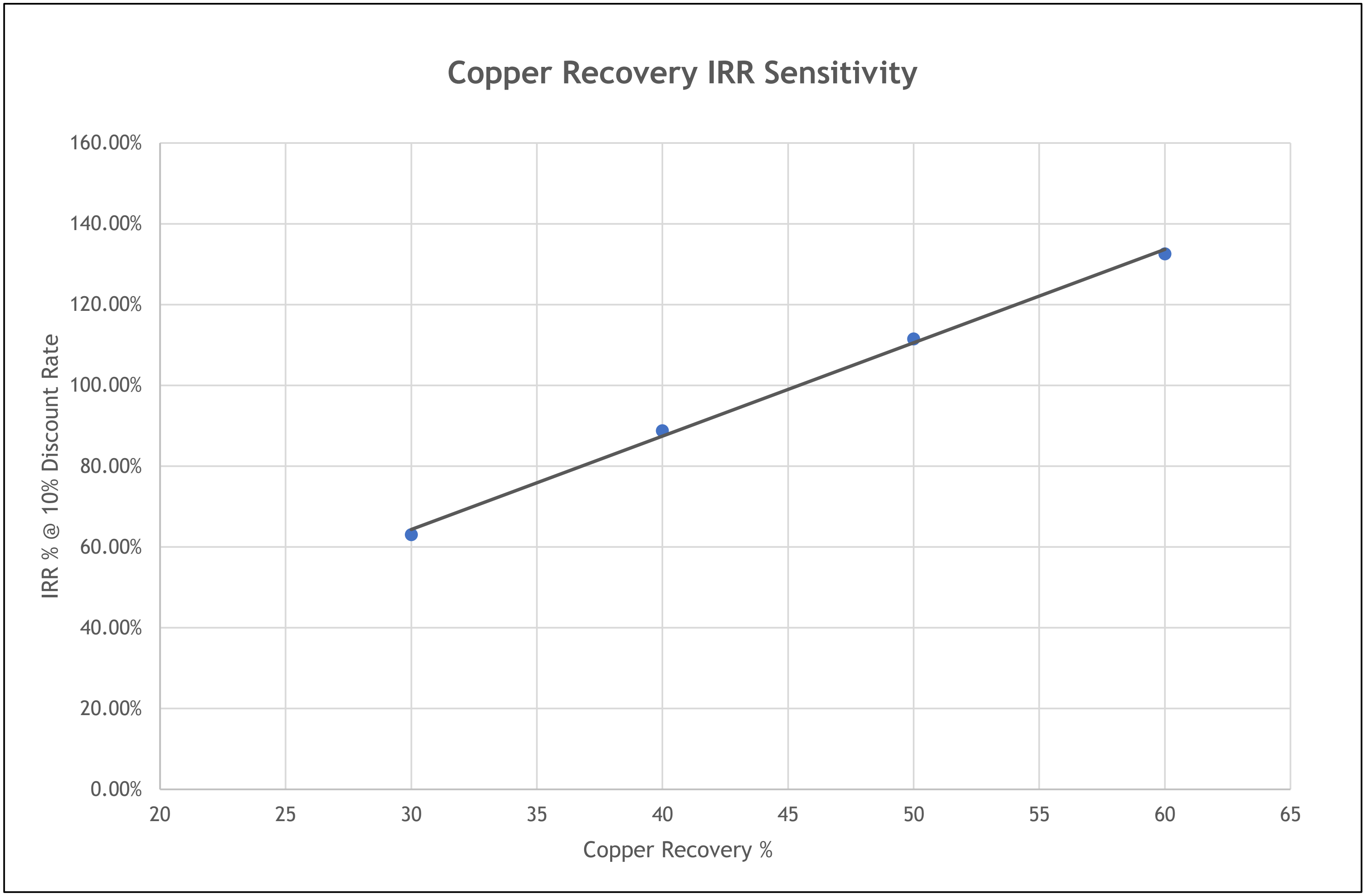
Payback Time	Payback period - Stage 2					
	Scenario	-20%	-10%	0	+10%	+20%
	CAPEX	0.96	1.10	1.27	1.43	1.61
	OPEX	1.20	1.23	1.27	1.29	1.34
	Copper Price	1.80	1.48	1.27	1.10	0.97
	Silver Price	1.31	1.28	1.27	1.24	1.22
	Copper Feed Grade	1.80	1.48	1.27	1.10	0.97
	Silver Feed Grade	1.31	1.28	1.27	1.24	1.22


NPV Sensitivity Chart
1,400,000,000
1,200,000,000
1,000,000,000
800,000,000
600,000,000
400,000,000
200,000,000
0
Pre tax NPV 10.0% (AUD)
-20%
-10%
0
+10%
+20%
% of Base Case
CAPEX
OPEX
Copper Price
Silver Price
Copper Feed Grade
Silver Feed Grade


IRR Sensitivity Chart
120
100
80
60
40
20
0
Internal Rate of Return(%)
-20%
-10%
0
+10%
+20%
% of Base Case
CAPEX
OPEX
Copper Price
Silver Price
Copper Feed Grade
Silver Feed Grade


Copper Recovery NPV Sensitivity
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
NPV @ 10% Discount Rate
Billions
Copper Recovery %
30%
40%
50%
60%

Copper Recovery	30	40	50	60
IRR	63.10%	88.79%	111.54%	132.56%
Payback Period - Stage 1	0.85	0.45	0.30	0.23
Payback Period - Stage 2	1.69	1.09	0.81	0.64



APPENDIX I – Risk Assessment

Appendix items

METS ENGINEERING
PROCESS + INNOVATION

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DOCUMENT COVER SHEET

CLIENT: Cobre Limited

PROJECT TITLE: Ngami Copper Project

PROJECT NO.: J5945

DOCUMENT TITLE: ISCR Project Risk and Opportunities Register

DOCUMENT NO: J5945-P-RA-000-001

THIS DOCUMENT HAS BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE FOLLOWING WORK INSTRUCTIONS / CHECKLISTS TO THE NOMINATED CHECKING METHOD & LEVEL.			
CHECKING METHOD		CHECKING LEVEL	
WORK INSTRUCTION / CHECKLIST NO.		OR	CH
	NAME	DATE	
OR			
CH			

Rev	Date	Revision	By	Ch'k	Appv.
4	14/10/24	Issued for Information	AR	JB	DC
3	30/09/24	Issued for Client Review	AR	JB	DC
2	20/09/24	Issued for Internal Review	AR	JB	DC
1	12/08/24	Issued for Internal Review	AR	JB	DC
0	11/07/24	Issued for Information	MN	JB	DC
D	10/07/24	Issued for Internal Review	MN	JB	DC
C	27/06/24	Issued for Internal Review	MN	JB	DC
B	19/05/24	Issued for Internal Review	MN	MN	DC
A	20/05/24	Issued for Internal Review	JK	MN	DC

Risk Matrix

Likelihood \ Consequence	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Almost Certain (5)	High Risk 5	High Risk 10	Extreme Risk 15	Extreme Risk 20	Extreme Risk 25
Likely (4)	Moderate Risk 4	High Risk 8	High Risk 12	Extreme Risk 16	Extreme Risk 20
Possible (3)	Low Risk 3	Moderate Risk 6	High Risk 9	Extreme Risk 12	Extreme Risk 15
Unlikely (2)	Low Risk 2	Low Risk 4	Moderate Risk 6	High Risk 8	Extreme Risk 10
Rare (1)	Low Risk 1	Low Risk 2	Moderate Risk 3	High Risk 4	High Risk 5

Likelihood Table: (What is the likelihood/probability of the event occurring?)

Level	Descriptor	Description/Frequency
E	Almost Certain	The event is expected to occur in most circumstances (more than once a year)
D	Likely	The event will probably occur in most circumstances (At least once a year)
C	Possible	The event should occur at some point (at least once in 3 years)
B	Unlikely	The event could occur at some time (at least once in 10 years)
A	Rare	Then event may occur in exceptional circumstances (more than 15 years between events)

Consequence Table: (What is the "maximum reasonable" consequence of the event if it did occur?)

Level	Safety	Environment	Quality	Equip/Asset Damage or lost savings	Production Interruption
5 Catastrophic	Fatality or permanent disability	Major issue serious long term impact	Product unsaleable after rework (dumping required), loss of market share	>$10M	>1 month
4 Major	LTI/SPI	Significant issue medium term impact	Intermediate or final product contamination, no ability to rectify, reduced revenue for product or	$5M to $1 0M	1 week to 1 month
3 Moderate	MTI	Continuous issue but limited impact	Product impurities, rework will correct problem	$1M to $5 M	24 hrs to 1 week
2 Minor	MI	Minor non-recurring issue	Intermediate product impurities rework will rectify problem	$100,000 to $1M	4 hrs to 24 hrs
1 Insignificant	Minor incident	Technical issue, involving environ. laws and regs.	Internal or non-contractual off-specification	<$100,000	<4 hrs

	Risk	Risk Description	Risk Comments	Pre controls	Pre controls	Pre controls	Existing Controls	Risk Treatments / mitigants	Post controls	Post controls	Post controls	Opportunities
Risk ID.	General Category	Describe Risk: What process is the risk a part of?	Describe Impact: What will happen if the risk is not mitigated or eliminated	Likelihood	Consequence	Previous	Do existing processes manage this risk to reduce the Company's exposure?	How will you manage this risk to reduce the Company's exposure?	Likelihood	Consequence	Revised	What opportunities exist?
						Risk Grade					Risk Grade	
G. Geology and Resources												
G1	Recoverable Copper	Recoverable copper in the ore is lower than predicted from testwork and modelling.	Lower than expected copper recoveries results in low copper productions and low revenue.	Possible (3)	Major (4)	Extreme Risk 12	Ongoing testwork programs, Geochemical models, continue grade control during operation metallurgical modelling	PLS Monitoring system to track recovery rates recovery modelling process optimisation based on real- time data, pilot test, contingency plan	Unlikely (2)	Major (4)	High Risk 8	Exploration of additional ore zones, optimisation of processing techniques, technology upgrades
G2	Ore Body Variability	Variable ore zones	Variable ore zones not identified and hence not tested. Recoveries and viability not well understood.	Possible (3)	Moderate (3)	High Risk 9	Geological Survey, geostatistical modeling, testwork, continuous core drilling and sampling, continuous metallurgical sampling of wellfield	Flexible leaching strategies tailored to specific zones, Real-time monitoring and adjustment of processes, incorporation of variability data into predictive models	Unlikely (2)	Major (4)	High Risk 8	Optimisation of leaching strategies, better geological modeling, enhanced data analytics
G3	Chalcopyrite	Non leaching copper ores like chalcopyrite	Lower than predicted recoveries. Lower copper production and reduced revenue.	Possible (3)	Moderate (3)	High Risk 9	Geological Survey, ore characterisation and testwork.	Incorporate secondary methods like bacterial leaching or alternative leaching reagents/strategies for chalcopyrite.	Unlikely (2)	Major (4)	High Risk 8	Development of alternative processing methods
G4	Clays	Presence of clays in the ore body	Cause throughput issues and operability of SX circuit. Impact pumping from ISCR	Possible (3)	Moderate (3)	High Risk 9	Thickeners and Clarifiers/Sand filters to filter PLS.	Use of crud handling system and clarifiers in the processing plant .	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved dewatering techniques
G5	Calcium	High calcium in ore may cause calcium sulfate precipitation (gypsum) in the orebody formation which can block the fractures and reduce flow.	Gypsum formation reduce flow of leaching solution, reduce copper oxide leaching and reduce copper recovery rates.	Possible (3)	Major (4)	Extreme Risk 12	Maintaining a bleed stream to reduce cation buildup , use chemical inhibitors (such as gypsum inhibitors)	Monitoring of calcium levels, Introduce chelating agents to bind calcium ions, adjust pH levels to minimise gypsum formation, using acidified water flushes to clear blockages.	Unlikely (2)	Moderate (3)	Moderate Risk 6	Extracting and selling gypsum as a by-product
G6	Carbonates	Carbonate levels in ore variable and higher than predicted.	High acid consumption and formation of CO2 may impact flowrates. Reduce copper recoveries. Increased costed and reduced revenues.	Unlikely (2)	Major (4)	High Risk 8	Grade control ahead of solution mining. Controlled acid addition strategies, use acid pre-treatment or adjust pH of leaching fluids	Conduct continuous monitoring of carbonate content during leaching, monitor in advance using met testwork and geological information	Rare (1)	Major (4)	High Risk 4	Reducing acid consumption costs, improving environmental footprint of operations
G7	Iron	Soluble iron. Ferrous iron soluble in water at any pH and ferric iron is soluble at pH less than 3.5. build up of iron ions in the SX circuit	Effect SX efficiency and copper recoveries. Increased costs and reduced revenue	Possible (3)	Moderate (3)	High Risk 9	Testwork, Fe bleed from EW circuit, regular monitoring of iron concentrations, monitoring of ferrous/ferric ions in solution important for bacterial leaching	Steady state PLS grade, optimisation extractant reagent and use of scrubbing stage in SX plant	Unlikely (2)	Moderate (3)	Moderate Risk 6	Enhanced recovery efficiency
G8	Impurities	A buildup of impurities in the raffinate	Lead to reduced SX efficiency	Possible (3)	Moderate (3)	High Risk 9	Regular monitoring of raffinate composition, regular laboratory analyses.	Use of clarifies, settling ponds and adjustments in O:A ratios in the extraction part of the SX circuit.	Likely (4)	Minor (2)	High Risk 8	Potential for by-product recovery
G9	Precipitates	Formation of precipitates underground	Lower sweep efficiency and reduced copper leaching and recovery rates.	Possible (3)	Major (4)	Extreme Risk 12	Geohydrology and hydrology studies to identify areas prone to precipitate, Regular monitoring of conditions such as ph levels, concentration of leach liquor entering and exiting the wells	Install sensors to monitor changes in rock permeability and composition of the leach solution, remediation plans	Possible (3)	Moderate (3)	High Risk 9	Use of inhibitors to prevent precipitation
G10	JORC	JORC resource minimal measured resource to exploit limits life of mine modelling	Overestimation of resource and contained copper value.	Unlikely (2)	Major (4)	High Risk 8	Exploration plans with infill drilling, geological modeling, strict JORC compliance.	lower cut-off grades, dynamic LOM modeling, conduct periodic reassessments of the ore body.	Unlikely (2)	Moderate (3)	Moderate Risk 6	define areas of high grade
G11	Structural Geology	Structural geology - along strike.	Leach field containment failure	Possible (3)	Major (4)	Extreme Risk 12	Structural analysis and mapping	Directional drilling to mitigate risk, grouting to reinforce weak zones	Unlikely (2)	Minor (2)	Low Risk 4	directional drilling, extend leach field capacity
G12	Mineralogy	Refractory Mineralogy	Lower than expected copper recoveries results in low copper productions and low revenue.	Possible (3)	Major (4)	Extreme Risk 12	Detailed mineralogical analysis and phase identification -samples from wellfield drill holes	Adjust leaching conditions based on mineralogy	Unlikely (2)	Major (4)	High Risk 8	Improved recovery rates
G13	Domains	Define ore domains for solution mining and processing strategies.	Different copper recoveries	Possible (3)	Moderate (3)	High Risk 9	Geological and geochemical characterisation, metallurgical characterisation using leaching on wellfield samples	Tailored leaching strategies for each domain, real-time monitoring, data collection and subsequent modelling	Unlikely (2)	Moderate (3)	Moderate Risk 6	Optimise processing efficiency
G14	Drill Holes	Define strategy for past diamond drill holes	Failure to cap safety and environmental risk	Possible (3)	Moderate (3)	High Risk 9	Review historical drilling data, site inspections	Audit and mapping of all historical drill holes, proper capping and sealing of open holes	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved safety and reduced liability. Use previous drill holes as future production wells.
G15	Cut off grade	Cut off grade - definition of the ore body. Determines the LOM, resource and risk exposure.	Overestimation of resource and contained copper value.	Possible (3)	Major (4)	Extreme Risk 12	Economic and geostatistical analysis	Dynamic cut-off grade modeling based on real-time data, Sensitivity analysis considering market fluctuations, use conservative estimation methods	Unlikely (2)	Moderate (3)	Moderate Risk 6	Accurate resource estimation, technology for better resource modeling, financial strategies for risk mitigation
G16	ISCR Field Drill Core	For metallurgical head assaying to map field	Poor reconciliation, determining leach recoveries and reconciliation. Inability to model leaching	Possible (3)	Major (4)	Extreme Risk 12	Detailed core logging and metallurgical testing	Leach the drill holes to map the field for recoveries, update leach models,	Unlikely (2)	Minor (2)	Low Risk 4	Optimization of leaching model accuracy, identifying optimal leaching conditions early on, better data integration
G17	Carbon Dioxide	Impact on well field and pumping	Reduced pumping, lower copper recoveries and revenue	Possible (3)	Moderate (3)	High Risk 9	Monitoring of CO_2 levels in well field via drill hole sensor	Predicting field behaviour with sound hydrological and mineralogical information	Unlikely (2)	Minor (2)	Low Risk 4	Predicting areas where CO2 buildup may be an issue will allow avoidance of this area
H. Hydrogeology and Hydrology												
H1	Water Availability	Lack of water in the area	Additional cost for water pipelines.	Possible (3)	Major (4)	Extreme Risk 12	Water recycling systems, water sourcing strategy	Implement water-saving technologies; consider alternative water sources, , use borefield in future wellfield planning	Unlikely (2)	Moderate (3)	Moderate Risk 6	Use of treated wastewater for process. Use water from future wellfield aquifer.
H2	Ground Water	Ground water availability	Source from distant ground water using pipeline. Pipeline cost.	Likely (4)	Moderate (3)	High Risk 12	Regular monitoring of groundwater levels.	Installation of deeper wells; develop groundwater recharge strategies.	Unlikely (2)	Moderate (3)	Moderate Risk 6	Long-term water sustainability
H3	Surface Water	Surface availability	Increase bore water dependence.	Possible (3)	Moderate (3)	High Risk 9	Creation of surface water reservoirs, surface water monitoring systems.	Development of surface water management plans; construction of retention ponds, water recycling	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved water availability
H4	Water Quality	Water quality poor - hardness and impurities	Additional cost for water treatment. Reduced leaching and process efficiencies.	Possible (3)	Major (4)	Extreme Risk 12	Regular water assays and treatment.	Implement advanced water treatment technologies	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improving water quality could reduce processing costs
H5	Well Head Pressure	Well head pressure build up over time - pump tests build up high pressure over time	Reduced wellfield performance. Reduced leachability and copper recovery.	Possible (3)	Moderate (3)	High Risk 9	Installation of pressure relief systems.	Regular maintenance and calibration of pumps; installation of pressure control valves.	Unlikely (2)	Moderate (3)	Moderate Risk 6	Extend operational life of wellfields
H6	Seal Rock	Presence of seal rocks to contain acid hanging wall and foot wall	Leach solution escapes containment of the wellfield. Environmental and water contamination. Public perception	Possible (3)	Moderate (3)	High Risk 9	Use of monitoring wells	Continuous monitoring and sampling program	Unlikely (2)	Moderate (3)	Moderate Risk 6	Minimise environmental impact
H7	Rainfall	Rainfall into process flows	Increased water flows and stream dilutions in ponds and open tanks.	Likely (4)	Moderate (3)	High Risk 12	Weather monitoring systems, use of covered tanks and event ponds to handle runoff and overflows	Installation of drainage systems; and diversion drains to control and direct water to event ponds. Water treatment system.	Possible (3)	Minor (2)	Moderate Risk 6	Capture and reuse of rainwater, event ponds prevent overflow of ponds- environment damage
H8	Evaporation	Evaporation	Water loss from ponds and open tanks.	Possible (3)	Moderate (3)	High Risk 9	Use of covered tanks and ponds (if practical)	Implementation of a water management system, optimise water use efficiency	Possible (3)	Minor (2)	Moderate Risk 6	Reduce water balance gains and save costs on water treatment.
H9	Water Management	Water management	Water management of wellfield and process accounting for a ingress and losses	Possible (3)	Moderate (3)	High Risk 9	Water balance monitoring; regular audits	Implementation of a water management system, optimise water use efficiency	Unlikely (2)	Minor (2)	Low Risk 4	Sustainable water use; reduce operational costs
H10	Permeability and Porosity	Permeability and porosity	Copper leachability and recovery reduced. Reduced revenue.	Possible (3)	Major (4)	Extreme Risk 12	Geophysical surveys; rock permeability and porosity testing	Optimise well placement and spacing based on permeability data.	Possible (3)	Moderate (3)	High Risk 9	Improve copper recovery rates
H11	Variability	Hydrogeology variability along the ore body	Variable wellfield performance variable copper recoveries	Possible (3)	Moderate (3)	High Risk 9	Detailed hydrogeological mapping and metallurgical recovery testwork on wellfields; continuous monitoring	Tailor leaching strategies to local hydrogeological conditions	Possible (3)	Moderate (3)	High Risk 9	Optimise copper recovery; reduce operational variability, predictive tool for leaching recovery
M. Geotechnical and Mining												
M1	Well Depth	Deep holes required for injection and recovery well to access mineralised zone. 70 m overburden and fractured mineralisation extends beyond 200 m .	Cost and difficulty in placing wells in optimum locations to inject and recover from the mineralised zone.	Possible (3)	Moderate (3)	High Risk 9	Detailed site surveys before drilling to ensure correct placement of wells, Directional drilling techniques	Use of directional drilling techniques to optimise well placement	Unlikely (2)	Moderate (3)	Moderate Risk 6	Potential for deeper and accurate access to the orebody and increased recovery
M2	Well Field Arrangement	Well spacing and pattern to avoid short circuiting	Lower recovery reduced revenues	Possible (3)	Moderate (3)	High Risk 9	Well spacing models, directional drilling to optimise spacing; implement real-time monitoring of well performance	Implement corrective drilling	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved recovery efficiency
M3	Hanging Wall	Hanging wall	Containment of the well field and ore body	Possible (3)	Moderate (3)	High Risk 9	Geotechnical/hydrological surveys	Continuous monitoring of wall sealability- using monitoring wells	Possible (3)	Moderate (3)	High Risk 9	Improved containment of wellfield
M4	Footwall	Footwall definition below	Containment of the well field and ore body	Possible (3)	Moderate (3)	High Risk 9	Geophysical mapping of the footwall	Continuous monitoring of wall sealability- monitoring wells	Possible (3)	Moderate (3)	High Risk 9	Enhanced containment and operational safety
M5	Monitoring Wells	Monitoring well placement is vital	Unidentified wellfield containment breach	Possible (3)	Major (4)	Extreme Risk 12	Strategic placement of monitoring wells	Continuous monitoring and adjustment	Unlikely (2)	Minor (2)	Low Risk 4	Early detection of potential issues
M6	Drill hardness	Geotechnical study hardness for drilling	Cost of injection and recovery well drilling. Determine wellfield arrangement and cost	Possible (3)	Moderate (3)	High Risk 9	Geotechnical study hardness for drilling, use of high-quality drill bits and drilling fluids	Adjust drilling techniques based on real-time data	Unlikely (2)	Minor (2)	Low Risk 4	Increased drilling efficiency and cost reduction

	Risk	Risk Description	Risk Comments	Pre controls	Pre controls	Pre controls	Existing Controls	Risk Treatments / mitigants	Post controls	Post controls	Post controls	Opportunities
Risk ID.	General Category	Describe Risk: What process is the risk a part of?	Describe Impact: What will happen if the risk is not mitigated or eliminated	Likelihood	Consequence	Previous	Do existing processes manage this risk to reduce the Company's exposure?	How will you manage this risk to reduce the Company's exposure?	Likelihood	Consequence	Revised	What opportunities exist?
						Risk Grade					Risk Grade	
M7	Fracturing	Fracturing and connectivity may be variable . Blind fractures, low fracture density and/or fracture width resulting in poor contact of leach solution with copper orebody and hence lower sweep efficiency	Lower sweep efficiency leads to lower recoveries from the ISCR field.	Possible (3)	Moderate (3)	High Risk 9	Pre-fracture analysis and modeling	Monitor fracture propagation	Unlikely (2)	Minor (2)	Low Risk 4	Improved recovery efficiency and optimised fracturing techniques
M8	Well Casing	Drilling casing - 70m overburden	Additional well casing costs	Possible (3)	Moderate (3)	High Risk 9	Use of high-strength casing materials	Reinforcement of casing as necessary	Possible (3)	Moderate (3)	High Risk 9	Ensure long-term stability of wells
M9	Decommissioning	Field decommissioning	Additional cost to decommission and rehabilitate the ore body	Possible (3)	Moderate (3)	High Risk 9	Pre-planning for decommissioning,	Implement phased decommissioning to minimise costs	Unlikely (2)	Minor (2)	Low Risk 4	Rehabilitate field and groundwater according to permit/license
M10	Low Grade	Low grade	Reduced recoveries and reduced revenue	Possible (3)	Major (4)	Extreme Risk 12	Target high-grade ore zones, grade control in advance of wellfield development	Adjust recovery processes to maximize	Possible (3)	Moderate (3)	High Risk 9	High grade solution mining, Increase overall yield from low-grade ore
M11	Field Plug	Field plug - well head pressure	Reduced field performance and reduced recoveries	Likely (4)	Moderate (3)	High Risk 12	Regular pressure monitoring and maintenance	Implement pressure relief systems	Unlikely (2)	Minor (2)	Low Risk 4	Maintain optimal well performance
M12	Bunding	Bunding	Leaks from ISCR well field pumps need to be contained to avoid environmental contamination	Possible (3)	Moderate (3)	High Risk 9	Installation of high-capacity bunds	Continuous monitoring for leaks	Unlikely (2)	Moderate (3)	Moderate Risk 6	Minimise environmental impact
M13	Reconciliation	Grade control against metallurgical control will be challenging with ISCR.	Reporting confidence	Possible (3)	Moderate (3)	High Risk 9	Pre-reconciliation sampling and analysis	Leach the drill holes to map the field for recoveries	Unlikely (2)	Minor (2)	Low Risk 4	Improve reconciliation accuracy and recovery predictions
M14	Solution Mining	Solution mining - ISR - copper lack of track record	Historically limited successful implementation of copper ISR to date	Possible (3)	Moderate (3)	High Risk 9	Pilot testing and feasibility studies	Implement real-time monitoring and adjustments	Unlikely (2)	Minor (2)	Low Risk 4	Establish a successful track record for ISR
P. Metallurgy, Process Plant & Infrastructure												
P1	Leaching Kinetics	Leaching Kinetic slower than predicted	Reduced field performance and reduced recoveries	Possible (3)	Major (4)	Extreme Risk 12	Regular testing of leach rates	Alternative leaching agents	Possible (3)	Moderate (3)	High Risk 9	Optimisation of leaching conditions
P2	Silver Recovery	Silver recovery	Reduced silver production	Possible (3)	Moderate (3)	High Risk 9	Specific reagents for silver recovery, periodic monitoring of silver content	Alternative methods	Unlikely (2)	Moderate (3)	Moderate Risk 6	Increase overall recovery. Additional revenue streams.
P3	Acid Consumption	High Acid consumption	Increased operating costs	Possible (3)	Major (4)	Extreme Risk 12	Laboratory testing on drill samples ahead of solution mining	Optimisation of acid use in the SX plant	Possible (3)	Moderate (3)	High Risk 9	Reduced acid consumption and operational costs
P4	Sulphur passivation	Copper recovery	Reduced revenue, blocking of fractures	Possible (3)	Major (4)	Extreme Risk 12	Encourage natural bacterial leaching	Testwork - chloride ions effect on passivation layer improve copper extraction (covellite/bornite leaching)	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved copper extraction
P5	Copper Recovery	Copper recovery	Reduced revenue	Possible (3)	Major (4)	Extreme Risk 12	Regular monitoring of copper recovery rates	Adjust leaching parameters based on real-time data	Unlikely (2)	Moderate (3)	Moderate Risk 6	Increased copper yield
P6	Impurities	Impurities in leach liquor control of Fe	Lead to reduced SX efficiency and recovery	Likely (4)	Moderate (3)	High Risk 12	Regular impurity monitoring and control- use of scrubbing circuit in SX plant	Scrubbing circuit, precipitation or ion exchange to remove impurities	Possible (3)	Moderate (3)	High Risk 9	Improved process efficiency
P7	Scaling	Scale issues - pipework	Increased maintenance cost, increased downtime and reduced throughput. Reduced revenue and increased costs.	Possible (3)	Moderate (3)	High Risk 9	Routine descaling and maintenance	Anti-scaling agents, pre-treatment of water to reduce scaling	Unlikely (2)	Minor (2)	Low Risk 4	Reduced maintenance costs
P8	Fire	Fire risk	Damages, downtime and loss production. Reduced revenue and increased costs.	Possible (3)	Moderate (3)	High Risk 9	Fire detection and suppression systems, fire risk assessment and safety protocols	Regular fire drills and equipment checks	Unlikely (2)	Major (4)	High Risk 8	Enhanced fire prevention
P9	Crud	Presence of clay forming crud	Reduced flows into SX and tank house on recirc. Reduced production.	Possible (3)	Moderate (3)	High Risk 9	Thickeners, clarifiers and sand filters	Additional filtration techniques, Implement a pre-treatment stage to remove clays	Possible (3)	Moderate (3)	High Risk 9	Improved process reliability
P10	Water Balance	Water balance issues arising from rinsing	Negative water balance	Possible (3)	Major (4)	Extreme Risk 12	Water recycling and reuse, water balance assessment	Implement water recycling strategies	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved water management
P11	Metallurgical Accounting	Metallurgy balancing and monitoring	Challenging to achieve metallurgical balancing of the wellfield and process plant. Additional need for ongoing box tests. Small and large scale modelling of field.	Possible (3)	Major (4)	Extreme Risk 12	Pre-assessment of metallurgical balance, regular audits and cross-checks	Perform onsite leaching of drill holes. Half core for assay other for leach. Become common practice and procedure. In country testing.	Unlikely (2)	Moderate (3)	Moderate Risk 6	Metallurgical accuracy and reconciliation
P12	Met Testwork	Met testwork and modelling	Additional cost for modelling and metallurgical balancing of the wellfield and process plant. Additional need for ongoing box tests. Small and large scale modelling of field.	Possible (3)	Major (4)	Extreme Risk 12	Use of pilot-scale models	Optimise test methods and utilise predictive modeling software	Unlikely (2)	Moderate (3)	Moderate Risk 6	Enhanced process control
P13	Piloting	Piloting	Significant development cost to develop a pilot plant to run the pilot well field	Possible (3)	Major (4)	Extreme Risk 12	Pre-feasibility studies	Conduct pilot plant studies	Unlikely (2)	Moderate (3)	Moderate Risk 6	Potential for cost-effective scale-up
P14	Field Management	Management of the field	Challenges to manage field operation and expansion. Manage tenor and solution flows. Additional costs and procedural requirements.	Possible (3)	Major (4)	Extreme Risk 12	Pre-planning for field management	Implement field management software	Unlikely (2)	Moderate (3)	Moderate Risk 6	Optimised field operations
P15	Pipework	Pipework quantity	Capital and operating cost increase due to installation and maintenance of significant pipe works	Possible (3)	Major (4)	Extreme Risk 12	Pre-design of efficient pipework layout	Optimise pipe layout and materials	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced installation and maintenance costs
P16	Pumps	Pump selection - substantial pumping cost and vital equipment to the operation. Ability to handles solutions - chloride ions, acidic conditions pH<2	Costs, maintenance and downtime.	Likely (4)	Moderate (3)	High Risk 12	Regular pump performance monitoring	Implement energy-efficient pumps and maintenance schedules	Possible (3)	Minor (2)	Moderate Risk 6	Extended pump lifespan and reduced downtime
P17	Ponds	Ponds and tank sizing	Spillage and cost overrun	Possible (3)	Major (4)	Extreme Risk 12	Proper sizing and regular maintenance	Implement spill containment systems	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced risk of spillage
P18	Location	Location of plant - long resource	Increased pumping costs as wellfield expands	Possible (3)	Major (4)	Extreme Risk 12	Pre-assessment of location impact	Implement renewable energy solutions to reduce pumping cost	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced energy costs and environmental impact
P19	Power	Power supply - Power cost for EW	High operating cost contributor.	Possible (3)	Major (4)	Extreme Risk 12	Pre-assessment of power requirements	Optimise energy consumption	Unlikely (2)	Moderate (3)	Moderate Risk 6	Explore renewable energy integration
P20	Roads	Road infrastructure	Road conditions impact deliverables in and out	Possible (3)	Moderate (3)	High Risk 9	Pre-assessment of road conditions	Implement road maintenance programs	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved transport efficiency
P21	Airstrip	Airstrip	High transport cost due to remoteness	Possible (3)	Major (4)	Extreme Risk 12	Pre-assessment of airstrip requirements	Optimise air transport logistics	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced transport costs
P22	Shipping	Shipping products	Increased operating cost for transport from isolated site	Possible (3)	Major (4)	Extreme Risk 12	Strategic bulk shipping agreements	Optimise shipping schedules to reduce costs	Possible (3)	Moderate (3)	High Risk 9	Reduced shipping costs and increased efficiency
P23	Acid	Acid supply	Cost to source acid in sufficient quantity	Likely (4)	Major (4)	Extreme Risk 16	Long-term acid supply contracts	Explore building an onsite acid plant	Unlikely (2)	Moderate (3)	Moderate Risk 6	Secure local acid production
P24	Kerosene	Kerosene hazardous material	Flammable liquid with fire and explosion risk if not handled and stored safely	Possible (3)	Major (4)	Extreme Risk 12	Strict handling and storage protocols	Implement rigid safety procedures	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced fire risks
P25	Ferric Sulphate	Ferric sulphate	Cost of shipping and storage. Reagent consumption.	Possible (3)	Moderate (3)	High Risk 9	Long-term supply contracts	Optimise usage and investigate alternatives	Unlikely (2)	Moderate (3)	Moderate Risk 6	Explore alternative reagent suppliers
P26	Logistics	Logistics	High transport cost due to remoteness and large reagent consumption	Possible (3)	Moderate (3)	High Risk 9	Strategic logistics planning	Explore cost-saving logistics solutions	Possible (3)	Moderate (3)	High Risk 9	Reduced logistics costs
P27	Non Process Infrastructure	Non process infrastructure	Capital cost to develop sufficient infrastructure to support the project.	Possible (3)	Major (4)	Extreme Risk 12	Detailed cost-benefit analysis	Optimise infrastructure development	Possible (3)	Moderate (3)	High Risk 9	Reduced capital expenditure
P28	Accommodation Village	Accommodation village	Capital cost to establish site camp	Possible (3)	Moderate (3)	High Risk 9	Detailed planning and cost management	Modular accommodation solutions	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced setup costs
P29	Bunding	Bunding	Leaks from process plant need to be contained to avoid environmental contamination	Possible (3)	Minor (2)	Moderate Risk 6	Pre-design of bunding systems	Minimise environmental impact	Unlikely (2)	Moderate (3)	Moderate Risk 6	Minimized environmental impact
P30	Material of Construction	Materials of construction	Increased cost of material of construction to handle acid and chloride ions. Increase maintenance costs and downtime.	Possible (3)	Major (4)	Extreme Risk 12	Select appropriate materials	Regular inspections and maintenance	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced maintenance costs
P31	Sampling	Sampling	Representative sampling of the ore and solutions in wellfield for metal accounting and reporting.	Possible (3)	Moderate (3)	High Risk 9	Rigorous sampling protocols	Implement automated sampling and analysis systems	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved sampling accuracy
P32	Process Control	Process control of wellfield and process plant.	High capital cost investment loss production	Possible (3)	Moderate (3)	High Risk 9	Advanced process control systems	Continuous improvement of control systems, implement real-time process monitoring	Unlikely (2)	Moderate (3)	Moderate Risk 6	Increased process efficiency
P33	Extractant	Extractant supply	Interruption in extractant supply. Cost for transportation.	Possible (3)	Moderate (3)	High Risk 9	Long-term supply contracts	Secure long-term extractant supply contracts	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced supply chain disruptions

	Risk	Risk Description	Risk Comments	Pre controls	Pre controls	Pre controls	Existing Controls	Risk Treatments / mitigants	Post controls	Post controls	Post controls	Opportunities
Risk ID.	General Category	Describe Risk: What process is the risk a part of?	Describe Impact: What will happen if the risk is not mitigated or eliminated	Likelihood	Consequence	Previous	Do existing processes manage this risk to reduce the Company's exposure?	How will you manage this risk to reduce the Company's exposure?	Likelihood	Consequence	Revised	What opportunities exist?
						Risk Grade					Risk Grade	
P34	Spares	Spares storage and quantities	Increased cost in storage of spares due to isolate site and to mitigate risk for supply interruption.	Possible (3)	Moderate (3)	High Risk 9	Strategic spare parts inventory management	Implement just-in-time spares management	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced storage costs
P35	First fill	First fill quantity	Sizeable reagent first fill to site	Possible (3)	Moderate (3)	High Risk 9	Detailed planning and logistics management	Optimise first fill quantities	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced initial costs
P36	Supply contracts	Reagent supply contracts	Loss production from reagent supply shortage	Possible (3)	Major (4)	Extreme Risk 12	Long-term supply contracts	Develop alternative supply agreements	Unlikely (2)	Major (4)	High Risk 8	Reduced supply risks
P37	Salt	Salt supply	Cost in transportation. Consumption costs.	Possible (3)	Major (4)	Extreme Risk 12	Secure supply chain	Salt water lake - Lake Ngami source water	Unlikely (2)	Moderate (3)	Moderate Risk 6	Produce and source salt as well as water. Reduced transportation costs. Increased salt content may improve silver recovery.
P38	Salt effect	Salt effect on the SX/EW	Reduce SX/EW efficiency downtime and maintenance costs. Reduced revenue	Possible (3)	Major (4)	Extreme Risk 12	Monitor salt levels in process streams	Implement salt removal or management strategies	Possible (3)	Moderate (3)	High Risk 9	Enhanced SX/EW efficiency
P39	On site laboratory	Assay delays for production samples in SX/EW if sent off site	Production recovery. Reduced revenue and cost	Possible (3)	Major (4)	Extreme Risk 12	Establish an on-site laboratory	Optimise laboratory processes to reduce turnaround time	Unlikely (2)	Major (4)	High Risk 8	Reduced assay turnaround times
C. Construction and Commissioning												
C1	Material of Construction	Material of construction	Increased cost of material of construction to handle acid. Increase maintenance costs and downtime.	Possible (3)	Major (4)	Extreme Risk 12	Select appropriate materials, investigate local suppliers for specialised materials	Regular inspections and proactive maintenance, Source alternative materials	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced maintenance costs
C2	Skilled trades	Lack of skilled trades and labour	Increased cost to transport and house labour force	Possible (3)	Major (4)	Extreme Risk 12	Develop local workforce training programs	Partner with local institutions to build skill base	Unlikely (2)	Moderate (3)	Moderate Risk 6	Establish long-term training programs with local vocational schools
C3	Logistics	Transport logistics	High transport cost due to remoteness	Possible (3)	Major (4)	Extreme Risk 12	Strategic logistics planning	Negotiate long-term contracts with transport companies	Unlikely (2)	Moderate (3)	Moderate Risk 6	Optimise logistics routes and consider alternative transport methods, reduced logistics costs and increased efficiency
C4	Contractors	Lack of contractors in country	Additional cost during construction and operation to source labour	Possible (3)	Major (4)	Extreme Risk 12	Develop relationships with regional contractors	Offer incentives for local contractors to expand operations	Unlikely (2)	Moderate (3)	Moderate Risk 6	Encourage local contractor development through training and certification
C5	Aggregate	Aggregate for construction	Increased capital cost during construction	Possible (3)	Major (4)	Extreme Risk 12	Secure supply agreements with local quarries	Investigate alternative materials or recycled aggregates	Unlikely (2)	Moderate (3)	Moderate Risk 6	Cost savings through local sourcing
C6	Concrete	Batch concrete plant required	Additional costs and construction mobilisation/demobilisation	Possible (3)	Major (4)	Extreme Risk 12	Detailed cost-benefit analysis	Optimise plant setup and logistics to minimise costs	Unlikely (2)	Moderate (3)	Moderate Risk 6	Cost savings and efficiency improvements
C7	Construction camp	Camp accommodation during construction	Cost blow out	Possible (3)	Major (4)	Extreme Risk 12	Optimise camp size and facilities	Utilise modular accommodation units to scale according to need	Unlikely (2)	Moderate (3)	Moderate Risk 6	Explore partnerships with local hospitality providers to reduce costs
C8	Construction management	Management of the construction and commissioning workforce	Cost blow out. Project delays.	Possible (3)	Major (4)	Extreme Risk 12	Implement advanced project management software	Regular project reviews and adaptive management strategies	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved project delivery and cost control
F. Finance												
F1	Funding	Funding development	Difficulty funding piloting, testwork, studies and testing of field.	Possible (3)	Major (4)	Extreme Risk 12	Early engagement with potential investors	Develop partnerships with stakeholders and government for funding	Unlikely (2)	Moderate (3)	Moderate Risk 6	Explore grants and subsidies for early-stage development
F2	Offtake	Offtake for copper	Reduce risk by establishing offtake agreements. Define product splits and specifications.	Possible (3)	Major (4)	Extreme Risk 12	Establish long-term offtake agreements	Engage in pre-sales agreements with major buyers, diversify offtake agreements to reduce risk	Unlikely (2)	Moderate (3)	Moderate Risk 6	Long-term revenue security through stable offtake agreements
F3	Copper Price	Copper price	Fall in copper price reduced revenue	Possible (3)	Major (4)	Extreme Risk 12	Implement hedging strategies against copper price fluctuations	Produce copper sulfate as an alternative product	Unlikely (2)	Moderate (3)	Moderate Risk 6	Revenue stabilisation through diversification
F4	Recovery	Copper recovery	Reduced recovery leading to reduced revenue and operating shortfalls.	Possible (3)	Major (4)	Extreme Risk 12	Optimise leaching and recovery processes	Implement real-time monitoring and adjustment systems	Unlikely (2)	Moderate (3)	Moderate Risk 6	Increased efficiency and reduced revenue loss
F5	Project Cost	Project cost controls	Project development cost blowouts lead to project collapse.	Possible (3)	Major (4)	Extreme Risk 12	Implement strict budget controls and cost monitoring	Regular project budget reviews and adjustments	Unlikely (2)	Moderate (3)	Moderate Risk 6	Seek fixed-price contracts for major expenses
F6	Inflation	In country inflation	Inflation in country damage in country operations.	Possible (3)	Major (4)	Extreme Risk 12	Hedge against local currency fluctuations	Negotiate long-term contracts with price adjustments tied to inflation indices	Unlikely (2)	Moderate (3)	Moderate Risk 6	Explore sourcing and supply chain alternatives to reduce exposure to inflation
F7	Royalties	Royalties	Increase or changing royalties make project unsustainable.	Possible (3)	Major (4)	Extreme Risk 12	Engage with government to secure stable royalty agreements	Secure stability agreements with the host government to lock in royalty rates	Unlikely (2)	Moderate (3)	Moderate Risk 6	Long-term financial stability through secured agreements
F8	Development Costs	Development cost to FID	Increased cost during development. Difficulty funding piloting, testwork, studies and testing of field.	Possible (3)	Major (4)	Extreme Risk 12	Early and accurate cost estimation and budgeting	Secure flexible funding options to cover unforeseen costs	Unlikely (2)	Moderate (3)	Moderate Risk 6	Consider alternative financing models such as joint ventures or partnerships
L. Legal, Compliance and Statutory Reporting												
L1	Permitting	Permitting	Delay development of the project	Possible (3)	Major (4)	Extreme Risk 12	Early engagement with regulatory authorities	Regular follow-ups and maintain an open line of communication with authorities	Unlikely (2)	Moderate (3)	Moderate Risk 6	Expedite permitting by involving consultants with local expertise
L2	Environment	Environmental issues	Delay development of the project	Possible (3)	Major (4)	Extreme Risk 12	Conduct thorough environmental impact assessments	Implement comprehensive environmental management plans	Unlikely (2)	Moderate (3)	Moderate Risk 6	Seek environmental certifications that can enhance project approval chances
L3	Sovereign	Sovereign risk	Loss access to the project during development. Increased costs.	Possible (3)	Major (4)	Extreme Risk 12	Engage with government and local stakeholders	Political risk insurance and diversification of investment locations	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved political risk management and security of operations
L4	Equator Principles	Compliance with Equator principles	Additional compliance requirement to maintain operational standards. Additional ongoing costs.	Possible (3)	Major (4)	Extreme Risk 12	Align project development with Equator Principles early on	Regular audits and adjustments to ensure continuous compliance	Unlikely (2)	Moderate (3)	Moderate Risk 6	Opportunities for improved project finance terms
L5	Delays	Delays with permitting, legal, compliance	Delay development of the project	Possible (3)	Major (4)	Extreme Risk 12	Establish a clear timeline and monitor progress regularly	Expedite legal and compliance processes through early identification of potential issues	Unlikely (2)	Moderate (3)	Moderate Risk 6	Leverage local legal expertise to navigate complex regulatory environments
L6	Closure	Mine closure	Increased end of mine cost not forecasted.	Possible (3)	Major (4)	Extreme Risk 12	Plan for mine closure from the project's inception	Regularly update the closure plan to reflect current conditions and costs	Unlikely (2)	Moderate (3)	Moderate Risk 6	Enhanced financial planning for mine closure
L7	Decommissioning	Field decommissioning legal, compliance and reporting requirement must be meet. This will come with risk that must be considered during project development.	Increased end of mine cost not forecasted.	Possible (3)	Major (4)	Extreme Risk 12	Develop a comprehensive decommissioning plan early	Engage with regulators and stakeholders to ensure compliance	Unlikely (2)	Moderate (3)	Moderate Risk 6	Potential for improved site restoration and post-closure land use
X. Occupational Health, Safety and Environment & Social												
X1	Acid	Work force suffer acid burns	Loss time injury. Loss production and penalties.	Possible (3)	Major (4)	Extreme Risk 12	Process plant design and engineering of barriers and mitigations. Provide proper PPE and training	Installation of emergency showers and first aid stations	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved workforce safety and reduced injuries
X2	Fumes	Work force exposed to solvent fumes	Loss time injury. Loss production and penalties.	Possible (3)	Major (4)	Extreme Risk 12	Process plant design and engineering of barriers and mitigations. Ensure proper ventilation and PPE	Regular monitoring of air quality and fume extraction systems, use of respirators	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved air quality and workforce health
X3	Security	Security issues	Injury and death to work force. Unsafe environment for workers. Difficult to hire and retain. Lower production and increased costs.	Possible (3)	Major (4)	Extreme Risk 12	Enhance security measures (fencing, cameras, officers, guards)	Implement strict access control and security protocols	Unlikely (2)	Moderate (3)	Moderate Risk 6	Work with local law enforcement for enhanced security
X4	Terrorism	Terrorism	Injury and death to work force. Unsafe environment for workers. Difficult to hire and retain. Lower production and increased costs.	Possible (3)	Major (4)	Extreme Risk 12	Develop contingency plans and evacuation protocols	Increase collaboration with government and security agencies	Unlikely (2)	Moderate (3)	Moderate Risk 6	Enhance community relations to reduce terrorism risks
X5	ISCR Opposition	Opposition to ISCR locals	Delay or prevent development of the project	Possible (3)	Major (4)	Extreme Risk 12	Early community engagement and transparent communication	Addressing community concerns through regular consultations	Unlikely (2)	Moderate (3)	Moderate Risk 6	Promote community involvement in project planning
X6	Mining Opposition	Local community opposition	Delay or prevent development of the project	Possible (3)	Major (4)	Extreme Risk 12	Stakeholder mapping and engagement	Regular updates to the community on project progress and benefits	Unlikely (2)	Moderate (3)	Moderate Risk 6	Establish partnerships with local community leaders
X7	Corruption	Corruption	Delay or prevent development of the project	Possible (3)	Major (4)	Extreme Risk 12	Anti-corruption policies and regular audits	Collaboration with anti-corruption agencies and whistleblower protection	Unlikely (2)	Moderate (3)	Moderate Risk 6	Foster a culture of transparency and accountability
X8	Turnover	High turnover	Cost for additional onboarding. Loss time and production cost.	Possible (3)	Major (4)	Extreme Risk 12	Competitive compensation packages and regular employee engagement surveys	Employee retention programs and career development opportunities	Unlikely (2)	Moderate (3)	Moderate Risk 6	Create a positive work environment to reduce turnover
X9	Waste	Waste disposal	Additional cost to meet waste disposal regulations	Possible (3)	Major (4)	Extreme Risk 12	Implement waste reduction and recycling programs	Ensure compliance with local and international waste disposal regulations	Unlikely (2)	Moderate (3)	Moderate Risk 6	Waste minimisation strategies and recycling programs
X10	Dual Language	Dual language	Additional cost to manage a dual language workforce	Possible (3)	Minor (2)	Moderate Risk 6	Provide language training programs	Implement bilingual communication materials	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved communication and workforce cohesion
X11	Skilled Labour	Skilled labour availability in the area	Additional cost to transport and house expats.	Possible (3)	Minor (2)	Moderate Risk 6	Local workforce development and training programs	Collaboration with local educational institutions	Unlikely (2)	Moderate (3)	Moderate Risk 6	Create apprenticeship and internship programs

	Risk	Risk Description	Risk Comments	Pre controls	Pre controls	Pre controls	Existing Controls	Risk Treatments / mitigants	Post controls	Post controls	Post controls	Opportunities
Risk ID.	General Category	Describe Risk: What process is the risk a part of?	Describe Impact: What will happen if the risk is not mitigated or eliminated	Likelihood	Consequence	Previous	Do existing processes manage this risk to reduce the Company's exposure?	How will you manage this risk to reduce the Company's exposure?	Likelihood	Consequence	Revised	What opportunities exist?
						Risk Grade					Risk Grade	
X12	Social Engagement	Social engagement - medical services etc.	Additional cost and consideration to provide additional community services	Possible (3)	Minor (2)	Moderate Risk 6	Develop partnerships with local healthcare providers	Establish community health and welfare programs	Unlikely (2)	Moderate (3)	Moderate Risk 6	Enhanced community relations and project sustainability
X13	Acid Mist	Acid mist - EW	Loss time injury. Loss production and penalties.	Possible (3)	Major (4)	Extreme Risk 12	Installation of mist suppression systems	Ensure proper ventilation and regular equipment maintenance	Unlikely (2)	Moderate (3)	Moderate Risk 6	Improved worker safety and reduced exposure to hazardous conditions
X14	Fire	Fire risk	Loss time injury. Loss production and penalties.	Possible (3)	Major (4)	Extreme Risk 12	Install fire detection and suppression systems	Conduct regular fire drills and equipment inspections	Unlikely (2)	Moderate (3)	Moderate Risk 6	Enhanced fire safety and reduced production downtime
X15	Earthquakes	Earthquakes	Risk to ponds and tanks overflow and damage to infrastructure. Downtime and loss production.	Unlikely (2)	Major (4)	High Risk 8	Design structures to withstand seismic activity	Develop emergency response plans specific to earthquake scenarios	Unlikely (2)	Moderate (3)	Moderate Risk 6	Incorporate earthquake-resistant design in all new infrastructure
X16	Flooding	Flooding	Risk to environment of pond overflow and damage to infrastructure. Downtime and loss production.	Unlikely (2)	Major (4)	High Risk 8	Implement flood control measures	Installation of flood and drainage systems, regularly maintain drainage systems and infrastructure	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced risk of environmental contamination and infrastructure damage, Consider flood-proofing critical infrastructure
X17	100 year storm	100 year storms	Risk to environment of pond overflow and damage to infrastructure. Downtime and loss production.	Unlikely (2)	Major (4)	High Risk 8	Design infrastructure to withstand extreme weather	Implement regular inspections and maintenance of stormwater management systems	Unlikely (2)	Moderate (3)	Moderate Risk 6	Utilise predictive weather analytics to prepare for extreme events
X18	Spillage	Spillage to the environment	Environmental spillage of acid, organic, fuel or oils Loss of production and penalties	Possible (3)	Major (4)	Extreme Risk 12	Implement spill prevention and response plans	Regularly train staff on spill response procedures	Unlikely (2)	Moderate (3)	Moderate Risk 6	Reduced environmental impact and regulatory penalties
X19	Field leakages	Leakages into the Kalahari sands and surrounds. Breach operating permits and environmental regulation.	Social and environmental - permit risks, loss of production, increase in costs	Possible (3)	Major (4)	Extreme Risk 12	Addition and implementation of warning wells and monitoring wells. Warning wells used to indicate possible and future leaks from the field before reportable breaches.	Use redundancy systems to detect and address leaks before they become significant	Unlikely (2)	Moderate (3)	Moderate Risk 6	Enhanced early detection and mitigation of environmental risks

APPENDIX J – WSP Preliminary Groundwater Assessment

Insitu Copper Recovery Preliminary Ground Water Assessment

6 Summary of hydrogeology and conceptual groundwater model for the NCP

6.1 Hydrogeological setting

The NCP area is situated near the northern margin of the Kalahari Copper Belt, where the majority of known deposits in the KCB are found. It includes a significant strike of the sub-cropping contact between the Ngwako-Pan and D'Kar Formations, which is considered highly prospective for mineralisation.

Copper-silver mineralisation associated with the redox contact between oxidized Ngwako Pan Formation red beds and the underlying reduced marine sedimentary rocks of the D'Kar Formation. These mineralisations occur on the limbs of anticlinal structures.

The key geological units in the NCP area include:

- Unconsolidated and Semi-consolidated Kalahari Sands: These sands have a thickness of approximately up to 70 meters. The lower part consists of semi-consolidated calcretised sand..
- D'Kar Formation: This formation comprises reduced marine sedimentary rocks, such as sandstones, siltstones, shales, and minor conglomerates and is the primary host of mineralisation. These sedimentary rocks are predominantly found on the limbs of anticlinal structures and overlie the Ngwako Pan Formation red beds, forming the hanging wall.
- Ngwako Pan Formation (NPF) Red Beds: This unit consists of sandstones, siltstones, shales, and mudstones that exhibit a characteristic red coloration due to the abundance of iron oxides. These rocks form the footwall in the area.

Higher-grade copper mineralisation is found along the Ngwako Pan/D'Kar Formation contact, within a sub-vertically dipping fracture zone.

The hydrogeological investigations involved drilling two production wells (PW001 and PW002), which intersected sub-vertically dipping mineralisation associated with the target fracture zone, and several monitoring wells to assess the hydraulic properties of the aquifer, including groundwater flow direction, permeability, anisotropy, and groundwater quality.

6.2 Groundwater levels and flow direction

The depth to the groundwater level in all test wells and formations was consistent, measured at 124 meters below ground level (m bgl) or 978 meters Reduced Level (RL), approximately 48 meters below the base of the KAL formation. This significant depth is advantageous for injection, as it allows higher rates without the risk of water surfacing or leaking upwards into the KAL.

Copper mineralization (above a 0.5% cut-off) occurs at 1026 m RL and remains open-ended. Based on the current groundwater elevation, a small portion of copper mineralization exists above the water table. Injection trials confirmed the feasibility of increasing the water table by inducing a small groundwater mound through injection, potentially facilitating copper dissolution above the current water table.

Ongoing groundwater level monitoring is being conducted to determine seasonal fluctuations. The groundwater elevation is expected to follow the landform, being higher elevation beneath basement highs and lower beneath basement lows.

6.3 Hydraulic parameters, storativity and anisotropy

Aquifer testing, including slug, injection, and pumping tests, was conducted to determine hydraulic parameters such as hydraulic conductivity (K), transmissivity (T), storativity (S), and specific storage (Ss). These tests revealed the following key hydraulic characteristics for each formation:

- Hydraulic Conductivity (K): Copper-silver mineralisation along the redox boundary between the Ngwako Pan Formation and the D'Kar Formation exhibits moderate to high permeability. Hydraulic conductivity values range from 0.2 to 0.5 m/d (based on PW001), with hydraulic conductivity decreasing with depth, as seen in deeper well PW002.
- Specific Storage (Ss): Specific storage values calculated from monitoring wells ranged from 3.98×10^{-6} to 7.4×10^{-5} 1/m, indicating the aquifer's ability to store and release water.
- An anisotropy ratio as low as 0.001 suggests strong directional flow along the fracture plane.
- Footwall and Hanging Wall Seals: These formations exhibit significantly lower permeability (K values as low as 0.0008 to 0.001 m/d), providing natural barriers that confine the lixiviant within the mineralised zone
- Strong hydraulic connectivity between the production wells, particularly PW001 and PW002 (80 m apart), was confirmed. The observed anisotropy is critical for guiding fluid flow towards recovery wells, ensuring that the lixiviant remains confined within the mineralised copper-silver zone.

The analysis confirmed strong hydraulic connectivity between the production wells, particularly PW001 and PW002, located 80 meters apart. The anisotropy observed in the aquifer is critical for guiding fluid flow towards the recovery wells, ensuring that the injected solution remains within the targeted copper mineralisation.

6.3.1 Horizontal and vertical connectivity

Despite the reduction in hydraulic conductivity with depth, the fracture system at the NCP exhibits both horizontal and vertical hydraulic connectivity:

- Horizontal Connectivity: The pumping and injection tests demonstrated strong horizontal connectivity between PW001 and PW002, which are located 80 meters apart. This connectivity is aligned with the strike of the mineralised zone and suggests that fluid flow is concentrated along sub-horizontal fractures, facilitating lateral movement of injected solutions. Monitoring wells, particularly MW012, which intersected the mineralised zone, showed direct and rapid responses to pumping and injection tests, further confirming lateral flow along the fracture plane.
- Vertical Connectivity: Although hydraulic conductivity decreases with depth, the tests indicate that vertical connectivity is present between different levels of the fracture zone. During the combined pumping and injection test, the drawdown in PW002 was buffered when water was injected into PW001, suggesting that fluid moved vertically between the shallower and deeper sections of the fracture zone.

This dual horizontal and vertical connectivity is important for the ISCR process, as it allows injected lixiviant to permeate through the mineralised fracture zone both laterally and vertically, dissolving copper and facilitating its recovery. The stronger horizontal flow ensures that the lixiviant spreads efficiently along the strike of the mineralisation, while the vertical connection enables fluid transfer between upper and lower sections of the ore body.

6.4 Groundwater salinity and chemistry

The groundwater in the area has moderate salinity levels, with electrical conductivity (EC) values ranging from 1466 µS/cm to 1593 µS/cm. The recharge water used during injection tests had an EC of 1000 µS/cm, and a noticeable decrease in EC during injection suggests that the lixiviant is efficiently dispersing and interacting with the mineralised zone.

7 Conclusions

7.1 Feasibility of ISCR

Site characterisation efforts have focused on existing geological data and conducting a field program, including the installation of pumping/injection wells and monitoring wells. A series of pumping and injection trials were undertaken to assess key hydrogeological parameters, such as hydraulic conductivity and storage capacity, as well as assessing the aquifers' ability to undergo injection and pumping.

Economic recovery of acid-soluble copper using ISCR requires specific hydrogeological conditions:

- Saturated Ore Body: The ore body must be saturated.
- Porosity and Permeability: Adequate porosity and hydraulic conductivity within fractured bedrock are essential to allow leach solution circulation through the Cu mineralisation
- Hydraulic Connectivity: There must be a hydraulic connection to promote fluid movement between injection and recovery wells.
- Lixiviant Contact and Retention: Effective mineral contact and sufficient lixiviant retention time are critical.
- Additionally, deep groundwater levels are preferred to minimise risks of injectant return to the surface or migration to non-target areas.

7.2 Aquifer potential

The aquifer in the study area demonstrates strong potential for ISCR. Key findings include:

- Drilling and injection Tests: The aquifer supports injection rates of at least 3 L/s per well, with potential for higher rates.
- Anisotropy and hydraulic: The aquifer is anisotropic, with higher permeability (K = 0.5 m/d) along high density fracture zone associated with the lower mineralised cycle of the D'Kar Formation.
- The hydraulic conductivity of the mineralised fracture zone is ~0.2 m/d to 0.5 m/d and falls within the ISR feasibility window defined by Abzalov (2012) and recommended by IAEA (IAEA 2016).
- The fracture zone is bounded by lower (less-permeable) fracture counts associated with the underlying Ngwako Pan Formation footwall and overlying sandstone packages in the D'Kar Formation which provide lateral seals.
- The flow direction aligns with primary fracture mineralisation which facilitates solution to permeate through and dissolve the copper and fluid transfer between injection and recovery wells with minimal losses.
- Injection efficiency: A small injection rate raised the water table by 10 meters at 25 meters from the injection point, indicating the feasibility of accessing copper mineralisation above the water table.
- The retention time is expected to be sufficient, given compartmentalisation associated with mineralisation, demonstrated by the slow recession curves, post injection.
- Depth to water table is 124 meters below ground and is ideal for ISCR. This appears to be an optimal depth, sufficiently below the Kalahari cover to ensure fracture control preventing lateral migration, with a small portion of the orebody exposed above the water table.
- The above conditions allow for lixiviant to be circulated through the ore body, with sufficient contact and retention time with acid soluble copper in the ore body.

Potential wellfield array:

The characteristics of an aquifer, such as its extent and anisotropy, play a crucial role in determining the appropriate wellfield array for ISCR operations. In this case the aquifer exhibits strong anisotropy (narrow zone of enhanced permeability bounded by structural features of lower permeability) and as such a wellfield array consisting of a regular row of evenly spaced wells may be suitable. In this arrangement, rows used for injection alternate with rows used for extraction, which is known as line drives or alternating line drives.

To inform this the next phase of work, involves groundwater modelling is being undertaken to simulate the optimal number and spacing of injection and recovery wells, ensuring efficient and effective implementation of the in-situ leaching operation.

APPENDIX K – IMO Testwork Report

MEMORANDUM

To:	Cobre Limited	Job No:	6603
Attn:	Adam Wooldridge		
Copy:	Steve McGhee; Alex Borger		
From:	Lia Cherico		
Date:	23rd November 2023		

SUBJECT: Ngami Copper Project Metallurgical Testwork Memo Report

Independent Metallurgical Operations Pty Ltd (IMO) was requested by Cobre Limited to conduct metallurgical testwork on their Ngami Copper Project. The program involved a number of leach tests to assess the response of the ore to leach processes, with Cobre currently assessing the potential for in-situ leaching of the deposit.

A testwork flowsheet for the program is provided in ***APPENDIX A***.

1.1 Sample Provenance

Cobre Limited provided IMO with drill internal samples representing two drill holes (NCO20A and NCP19) from the Ngami Copper Project. The interval samples were coarse rejects remaining from an earlier assay program, with the material at a crush size of approximately 90% passing 2mm.

Two composite samples were generated for the testwork program, representing the high and low grade components of the ore. Composites were determined by Cobre Ltd with assistance from IMO.

Summarised interval details for each composite are provided in ***Table 1*** and ***Table 2*** indicating calculated copper head grades of 2.72% for the High Grade (HG) Composite and 0.56% for the Low Grade (LG) Composite.

Complete interval details are provided in ***APPENDIX B***.

Table 1: High Grade Composite Details Summary

Interval ID	Hole ID	From	To	Interval	Mass	Cu
		m	m	m	kg	%
KML4351	NCP20A	148.7	149.4	0.7	1.51	1.15
KML4352	NCP20A	149.4	150.0	0.6	0.93	0.54
KML4353	NCP20A	150.0	151.0	1.0	2.26	0.59
KML4354	NCP20A	151.0	152.0	1.0	1.77	0.51
KML4355	NCP20A	152.0	152.9	0.9	1.33	0.80
KML4356	NCP20A	152.9	153.8	0.9	1.93	5.07
KML4357	NCP20A	153.8	154.5	0.7	1.31	1.56
KML4358	NCP20A	154.5	155.3	0.8	2.55	1.04
KML4359	NCP20A	155.3	156.0	0.7	1.39	11.40
KML4360	NCP20A	156.0	157.0	1.0	0.75	9.28
High Grade Composite				**8.3**	**15.73**	**2.72**

Table 2: Low Grade Composite Details Summary

Interval ID	Hole ID	From	To	Interval	Mass	Cu
		m	m	m	kg	%
KML4243	NCP19	151.0	151.3	0.3	0.29	0.35
KML4244	NCP19	151.3	152.3	1.0	2.54	0.29
KML4245	NCP19	152.3	153.3	1.0	2.59	0.57
KML4246	NCP19	153.3	154.3	1.0	2.61	0.70
KML4247	NCP19	154.3	155.3	1.0	0.69	0.63
KML4250	NCP19	155.3	156.3	1.0	2.47	0.55
KML4251	NCP19	156.3	157.0	0.7	0.89	0.92
Low Grade Composite				**6.0**	**12.07**	**0.56**

1.2 Composite Characterisation

The High and Low Grade Composites were submitted to Intertek Group plc for head assay analysis. Summarised results are provided in ***Table 3*** indicating the following:

- Copper grades of 2.76% and 0.55% for the HG and LG Composites respectively, aligning well with the expected grades calculated based on interval assays;
- Iron grades of 4.15% and 4.26% for the HG and LG Composites respectively;
- Sulphur grades of 0.65% and 0.12%, with over 98% of the sulphur existing as sulphides;
- Acid soluble copper accounts for a low 8.8% and 9.9% of the total copper within the composites. These are likely present as chrysocolla and malachite minerals, typically readily extractable via leach processes;
- Cyanide soluble copper accounts for a large 88.9% and 85.3% of the total copper within the HG and LG Composites. This represents the dominant chalcocite minerals within the ore, presenting greater challenges in recovering via acid leach processes.

Table 3: Head Assay Results Summary

Element	Unit	Detection Limit	High Grade Composite	Low Grade Composite
Expected Cu	**%**		**2.72**	**0.56**
Cu	**%**	**0.001**	**2.76**	**0.55**
Ag	ppm	0.05	24.08	13.72
Ca	ppm	50	17,219	17,152
Fe	%	0.01	4.15	4.26
Mg	ppm	20	16,793	15,823
Pb	ppm	0.5	23	22.4
Zn	ppm	1	192	196
Total Carbon	%	0.01	0.55	0.48
Non-Carbonate	%	0.01	0.01	<0.01
Carbonate	%	0.01	0.54	0.48
Total Sulphur	%	0.01	0.65	0.12
Sulphate	%	0.01	0.01	<0.01
Sulphide	%	0.01	0.64	0.12
Copper Speciation:				
Cu Residue	ppm	1	602	242
Acid Soluble Cu	ppm	1	2,284	507
Cyanide Soluble Cu	ppm	2	23,132	4,347
Cu Residue	% Total Cu		2.3%	4.7%
Acid Soluble Cu	% Total Cu		8.8%	9.9%
Cyanide Soluble Cu	% Total Cu		88.9%	85.3%

1.3 Stage 1 Leach Testwork

Acid leach testing was conducted on the High and Low Grade Composites to assess the potential copper recoveries achievable via sulphuric acid leaching. A single Intermittent Bottle Roll (IBR) Leach Test was conducted on each composite at the following conditions:

- 20% solids density w/w in Perth tap water;
- Intermittent bottle roll, rolling 5 minutes every hour;
- pH 1 maintained with H_2SO4;
- Initial concentration of Fe^{3+} of 2 g/L from the addition of $Fe_2(SO4)_3$; and
- Eh to be maintained at approximately 400 mV (Ag/AgCl electrode).

Due to the high chalcocite content within the ore IMO included the addition of ferric sulphate to the leach conditions, targeting oxidation of the copper sulphide minerals to allow for their extraction via acid.

Complete leach datasheets are provided in ***APPENDIX D***.

Kinetic leach curves for the High and Low Grade Composite IBR tests are shown in ***Figure 1***, with summarised results provided in ***Table 4***. These results for the HG and LG Composites indicate the following:

- Overall copper leach recoveries of 45.4% and 50.0% respectively;
- Fast leach kinetics with instant leaching observed when mixing the sample in solution (solution visually turning blue). Within the first couple of minutes copper recoveries of 13.7% and 19.5% were achieved. This leaching can be attributed to the readily acid soluble copper within the ore (chrysocolla/malachite);
- Leaching appears to plateau after 72 hours for both samples;
- Calculated copper head grades of 2.57% and 0.50%, closely aligning with assay head grades of 2.76% and 0.55% respectively;
- Residue copper grades of 1.40% and 0.25% respectively;
- No silver recovery reported for both composites with calculated head grades equal to final residue silver grades;
- Ferric sulphate consumptions of 107 kg/t and 37 kg/t respectively;
- Sulphuric acid consumptions of 86 kg/t and 79 kg/t respectively.

The copper recoveries achieved for the High and Low Grade Composites are significantly higher than the Acid Soluble Copper content reported in the head assay analysis, indicating less than 10% (8.8% and 9.9%) of the total copper was acid soluble. This therefore proves that by adding ferric sulphate to the leach we have promoted the oxidation of some copper species, allowing them to be extracted via the acid leach.

Please note, the sudden shift in recovery noticed at the final 168 hour point can be attributed to error associated with kinetic sampling throughout the leach with difficulty in obtaining representative liquor sub samples. The final copper recoveries are determined based on the total copper within the final leach liquor and more accurately represent total copper extraction.

Figure 1: Stage 1 Leach Kinetic Curves

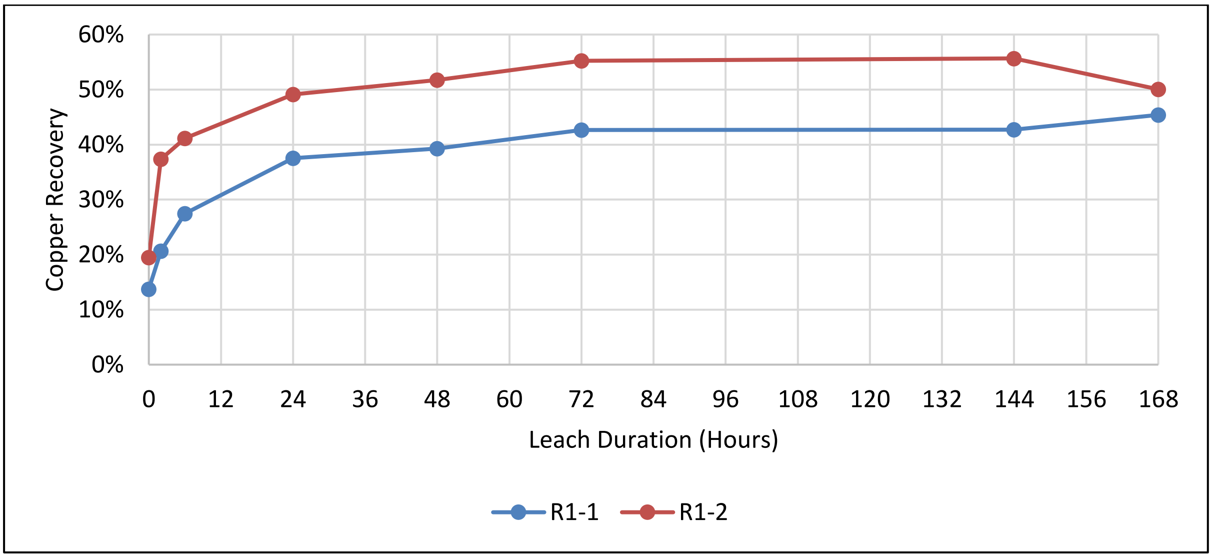


Table 4: Stage 1 Leach Results Summary

Composite		High Grade Composite	Low Grade Composite
Leach Test		**R1-1**	**R1-2**
Copper Results:			
Calc'd Cu Head Grade	%	2.57	0.50
Assay Cu Head Grade	%	2.76	0.55
0 Hr Cu Recovery	%	13.7%	19.5%
2 Hr Cu Recovery	%	20.6%	37.3%
6 Hr Cu Recovery	%	27.4%	41.2%
24 Hr Cu Recovery	%	37.5%	49.1%
48 Hr Cu Recovery	%	39.3%	51.8%
72 Hr Cu Recovery	%	42.7%	55.2%
144 Hr Cu Recovery	%	42.7%	55.7%
168 Hr Cu Recovery	%	45.4%	50.0%
Residue Cu Grade	%	1.40	0.25
Silver Results:			
Calc'd Ag Head Grade	ppm	24	15
Assay Ag Head Grade	ppm	24	14
168 Hr Ag Recovery	%	0%	0%
Residue Ag Grade	ppm	24	15
Reagents:			
$Fe_2(SO_4)_3$ Consumption	kg/t	107	37
H_2SO_4 Consumption	kg/t	86	79

Overall leach results indicate partial oxidation of the chalcocite, converting from Cu_2S to CuS, releasing one copper ion into the leach liquor as $CuSO_4$ and therefore explaining the 50% recovery. Further oxidation is therefore required for increased copper leach extraction. Based on these results IMO proposed further leach testwork be conducted targeting improved overall copper extraction.

1.4 Stage 2 Leach Testwork

A second stage of leach testwork was undertaken on the High and Low Grade Composites following completion of Stage 1. IMO conducted a total of five IBR leach tests on each composite as follows:

1. Assess the impact of increased ferric sulphate addition to maintain a higher oxidising reduction potential (ORP of ≥450 mv);
2. Assess the impact of low chloride addition to the system, with a chloride concentration of 20 g/L;
3. Assess the impact of high chloride addition to the system, with a chloride concentration of 100 g/L;
4. Assess the impact of potassium permanganate as an oxidant to maintain ORP (as opposed to ferric sulphate);

5. Assess the impact of an increased temperature of 70°C. Please note that in order to control temperature this test was conducted as an agitated vessel leach test.

Kinetic leach curves for the High and Low Grade Composites are shown in ***Figure 2*** and ***Figure 3*** with summarised results provided in ***Table 5*** and ***Table 6*** respectively. Results for the Stage 1 leach tests have been included in the below for comparative purposes.

These results indicate the following:

- Overall copper leach recoveries of:
  - HG Composite ranging from 45.4% to 97.8%;
  - LG Composite ranging from 50.0% to 97.8%;
- Increasing ferric sulphate addition to maintain an ORP at 450 mv (instead of approx. 400 mv) resulted in:
  - A 16.1% increase in HG Composite copper recovery, from 45.4% to 61.4%;
  - A 8.7% increase in LG Composite copper recovery, from 50.0% to 58.7%;
- Addition of 20 g/L chloride to the leach system resulted in:
  - A 13% increase in HG Composite copper recovery from 61.4% to 74.4%;
  - A 12.5% increase in LG Composite copper recovery from 58.7% to 71.2%;
  - Silver recoveries of 10.0% and 45.3% respectively;
- Increased chloride concentration to 100 g/L resulted in minor increases in Cu recovery (compared to 20 g/L chloride):
  - Increased HG Composite copper recovery from 74.4% to 77.4%;
  - Increased LG Composite copper recovery from 71.2% to 71.9%;
  - Silver recoveries of 43.5% and 80.5% respectively;
- The use of potassium permanganate to maintain ORP in place of ferric sulphate resulted in:
  - Reduced HG Composite copper recovery by 9.5% (from 61.4% to 52.0%);
  - No significant change in LG Composite copper recovery, increasing from 58.7% to 59.2%;
- Increased temperature from ambient to 70°C significantly increased copper extraction with both composites reporting a final copper recovery of 97.8%.

Overall results indicate copper recoveries above 70% can be achieved with an ORP maintained at 450 mv (via ferric sulphate addition) and a low chloride concentration. The results also highlight incredibly fast kinetics with over 97% recovery via standard milling/atmospheric leach processing at temperature (not applicable to in-situ or heap leach methods).

Fluctuations in copper recovery throughout the leach duration is evident in some of the tests, particularly in the temperature tests (R2-5 and R2-10) with recoveries reported over 100%. These fluctuations are a result of cumulative sampling and assay error of the liquor sub samples throughout the test, as seen in the Stage 1 testing. The final copper recoveries are determined based on the total copper within the final leach liquor and more accurately represent total copper extraction.

The Stage 2 testwork highlights the potential for silver recovery when leaching is undertaken in the presence of chloride concentrations as low as 20 g/L. Silver recoveries reached 43.5% and 80.5% for the High and Low Grade Composites in the presence of chloride, with all other tests reporting no silver extraction.

Figure 2: Stage 2 High Grade Composite Leach Kinetic Curves

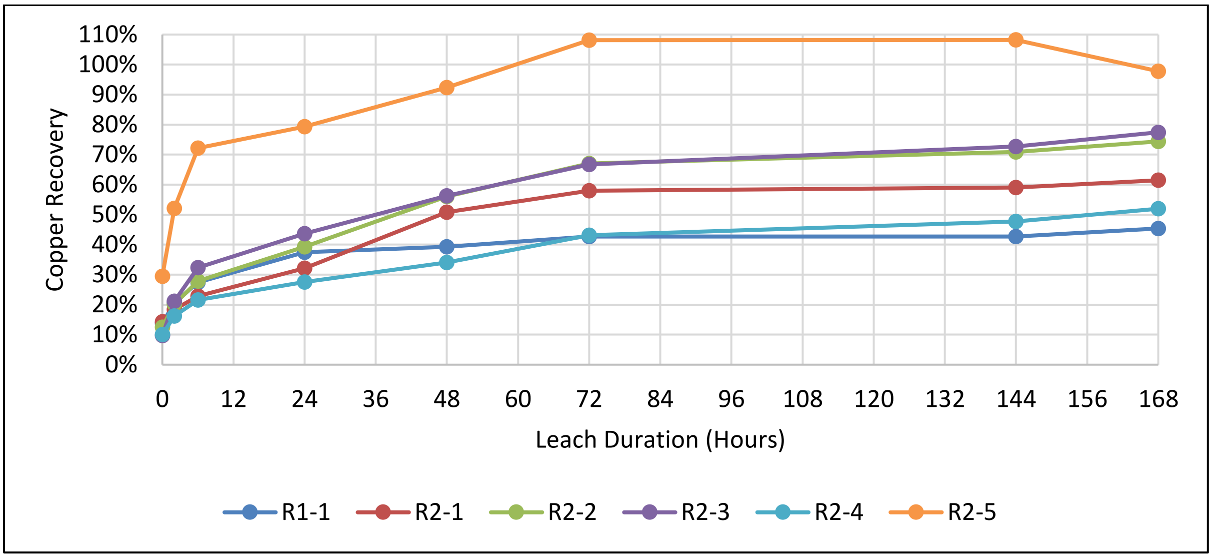


Figure 3: Stage 2 Low Grade Composite Leach Kinetic Curves

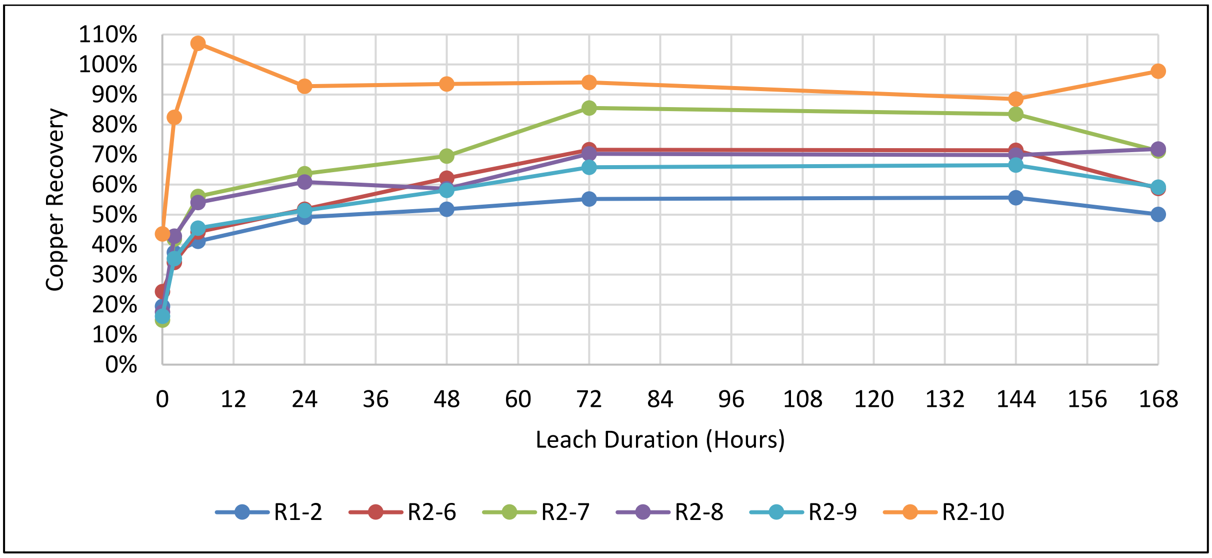


Table 5: Stage 2 High Grade Composite Leach Results Summary

Composite		High Grade Composite					
Round		1	2				
Leach Test		R1-1	R2-1	R2-2	R2-3	R2-4	R2-5
EH	mV	~400	≥450	≥450	≥450	≥450	≥450
Oxidant Reagent		$Fe_2(SO_4)_3$	$Fe_2(SO_4)_3$	$Fe_2(SO_4)_3$	$Fe_2(SO_4)_3$	$KMnO_4$	$Fe_2(SO_4)_3$
Chloride	g/L	-	-	20	100	-	-
Temperature	°C	Ambient	Ambient	Ambient	Ambient	Ambient	70
Copper Results:							
Calc'd Cu Head Grade	%	2.57	2.90	2.74	2.95	2.89	3.27
Assay Cu Head Grade	%	2.76	2.76	2.76	2.76	2.76	2.76
0 Hr Cu Recovery	%	13.7%	14.4%	12.5%	9.7%	10.0%	29.5%
2 Hr Cu Recovery	%	20.6%	18.4%	20.2%	21.2%	16.2%	52.1%
6 Hr Cu Recovery	%	27.4%	22.8%	27.9%	32.3%	21.6%	72.2%
24 Hr Cu Recovery	%	37.5%	32.2%	39.2%	43.6%	27.6%	79.3%
48 Hr Cu Recovery	%	39.3%	50.8%	56.0%	56.3%	34.1%	92.3%
72 Hr Cu Recovery	%	42.7%	58.0%	67.0%	66.7%	43.2%	108.1%
144 Hr Cu Recovery	%	42.7%	59.0%	70.9%	72.7%	47.7%	108.2%
168 Hr Cu Recovery	%	45.4%	61.4%	74.4%	77.4%	52.0%	97.8%
Residue Cu Grade	%	1.40	1.12	0.70	0.67	1.39	0.07
Silver Results:							
Calc'd Ag Head Grade	ppm	24	24	22	24	24	26
Assay Ag Head Grade	ppm	24	24	24	24	24	24
168 Hr Ag Recovery	%	0.0%	0.0%	10.0%	43.5%	0.0%	0.0%
Residue Ag Grade	ppm	24	24	20	14	24	26
Reagents:							
$Fe_2(SO_4)_3$ Consumption	kg/t	107	265	294	231	31	108
H_2SO_4 Consumption	kg/t	86	159	105	49	94	82
$KMnO_4$ Consumption	kg/t					173	

Table 6: Stage 2 Low Grade Composite Leach Results Summary

Composite		Low Grade Composite					
Round		1	2				
Leach Test		R1-2	R2-6	R2-7	R2-8	R2-9	R2-10
EH	mV	~400	≥450	≥450	≥450	≥450	≥450
Oxidant Reagent		$Fe_2(SO_4)_3$	$Fe_2(SO_4)_3$	$Fe_2(SO_4)_3$	$Fe_2(SO_4)_3$	$KMnO_4$	$Fe_2(SO_4)_3$
Chloride	g/L	-	-	20	100	-	-
Temperature	°C	Ambient	Ambient	Ambient	Ambient	Ambient	70
Copper Results:							
Calc'd Cu Head Grade	%	0.50	0.56	0.53	0.58	0.54	0.65
Assay Cu Head Grade	%	0.55	0.55	0.55	0.55	0.55	0.55
0 Hr Cu Recovery	%	19.5%	24.3%	14.9%	17.5%	16.1%	43.6%
2 Hr Cu Recovery	%	37.3%	34.1%	41.9%	42.9%	35.3%	82.4%
6 Hr Cu Recovery	%	41.2%	44.2%	56.0%	54.1%	45.5%	107.1%
24 Hr Cu Recovery	%	49.1%	51.8%	63.6%	60.9%	51.3%	92.8%
48 Hr Cu Recovery	%	51.8%	62.1%	69.5%	58.6%	58.1%	93.5%
72 Hr Cu Recovery	%	55.2%	71.6%	85.5%	70.3%	65.7%	94.1%
144 Hr Cu Recovery	%	55.7%	71.4%	83.5%	69.9%	66.5%	88.5%
168 Hr Cu Recovery	%	50.0%	58.7%	71.2%	71.9%	59.2%	97.8%
Residue Cu Grade	%	0.25	0.23	0.15	0.16	0.22	0.01
Silver Results:							
Calc'd Ag Head Grade	ppm	15	13	12	13	13	12
Assay Ag Head Grade	ppm	14	14	14	14	14	14
168 Hr Ag Recovery	%	0.0%	0.0%	45.3%	80.5%	0.1%	2.3%
Residue Ag Grade	ppm	15	13	7	3	13	12
Reagents:							
$Fe_2(SO_4)_3$ Consumption	kg/t	37	73	67	48	31	31
H_2SO_4 Consumption	kg/t	79	166	122	42	154	111
$KMnO_4$ Consumption	kg/t					33	

Reagent consumptions increased for both $Fe_2(SO_4)_3$ and H_2SO_4 throughout the Stage 2 tests, largely a result of targeting an increased ORP of 450 mv. However, the following points can be made:

- A reduction in H_2SO_4 consumption is shown for the high 100 g/L chloride concentration (test 3) for both composites; and
- The high temperature test indicated no change in $Fe_2(SO_4)_3$ consumption.

1.5 Conclusions & Recommendations

IMO undertook a metallurgical testwork program on behalf of Cobre Limited to assess the response of the ore to leach processes, with Cobre currently assessing the potential for in-situ leaching of the Ngami Copper Project.

The testwork program involved the generation of a High Grade and Low Grade Composite, undergoing two stages of leach testwork. Overall findings from the testwork undertaken on the Ngami Copper Project composites are as follows:

- Copper grades of 2.76% and 0.55% for the HG and LG Composites respectively.
- Acid soluble copper accounts for less than 10% of the total copper within the composites. These are likely present as chrysocolla and malachite minerals.
- Cyanide soluble copper accounts for more than 85% of the total copper within the composites, representing the dominant chalcocite minerals within the ore.
- Initial leach tests controlled at an ORP of approximately 400mv resulted in recoveries of 45.4% (HG Comp) and 50.0% (LG Comp).
- Fast leach kinetics were observed throughout the tests with leaching observed when mixing the sample in solution (solution visually turning blue). This leaching can be attributed to the readily acid soluble copper within the ore (chrysocolla/malachite).
- Increased ferric sulphate addition to maintain an ORP at 450 mv resulted in improved copper recoveries, increasing by 16.1% for the HG Composite and 8.7% for the LG Composite.
- Addition of 20 g/L chloride to the leach system resulted in increased copper recoveries by more than 10%. Further increasing the chloride concentration to 100 g/L resulted in minor improvements in recovery.
- The addition of chloride to the leach tests also allowed for the extraction of silver, achieving recoveries of 43.5% and 80.5% compared to all other tests reporting no silver extraction.
- Utilising potassium permanganate to maintain ORP in place of ferric sulphate reported a 9.5% reduction in copper recovery for the HG Composite and no significant impact on the LG Composite.
- Increased temperature from ambient to 70°C resulted in incredibly fast kinetics with over 97% recovery via standard milling/atmospheric leach processing at temperature (not applicable to in-situ or heap leach methods).

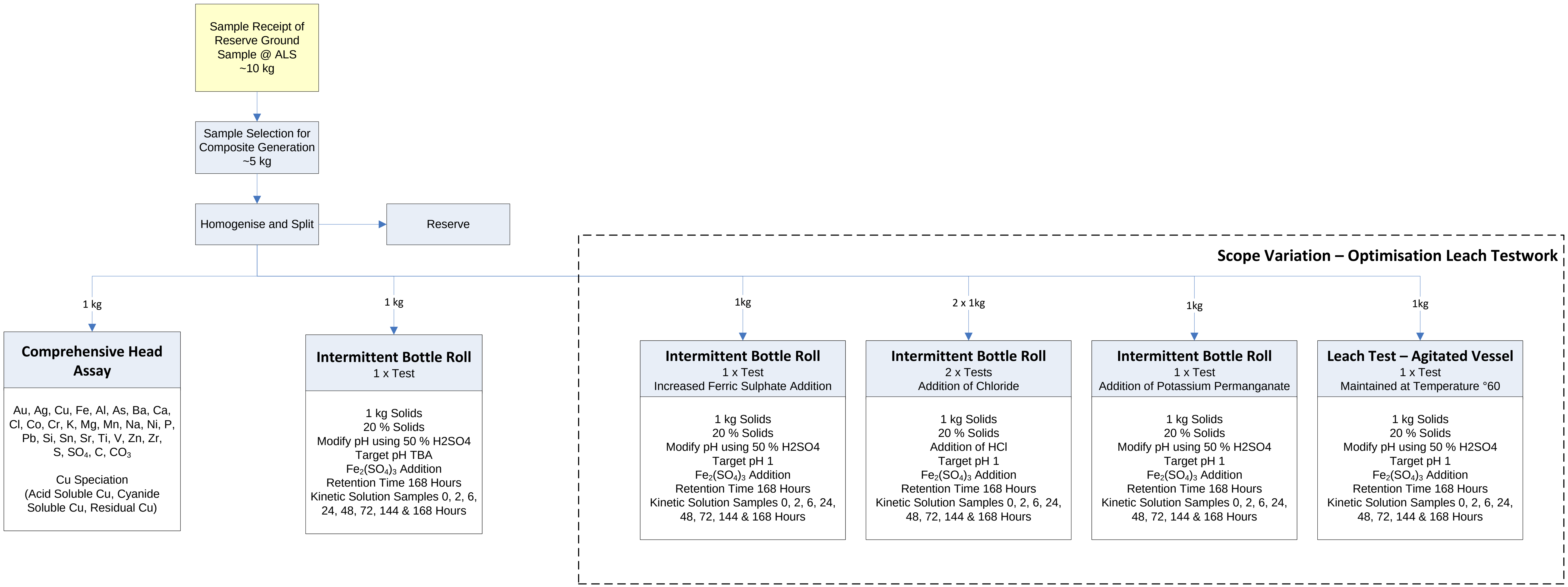
Overall results indicate copper recoveries above 70% can be achieved with an ORP maintained at 450 mv (via ferric sulphate addition) and a low chloride concentration.

Based on the testwork completed to date on the Ngami Copper Project composites, IMO recommend the following:

- Conduct further leach testwork to confirm the leach response of the Ngami ore at larger crush sizes, as opposed to the fine <2mm material tested to date;
- Conduct column leach testwork to assess the response of the ore under conditions closer replicating heap leach/in-situ leach processes; and
- Conduct further testing on a larger range of samples ensuring they represent the mineralogical, grade, spatial and depth variations within the ore body.

APPENDIX A TESTWORK FLOWSHEET

Testwork Flowsheet to be conducted on Two Composites,
1 High Grade & 1 Low Grade



REV	COMMENTS	DATE	BY	REFERENCE
1	Addition of Optimisation Testwork	31/07/23	LC	

INDEPENDENT METALLURGICAL OPERATIONS PTY LTD
88 Thomas Street West Perth WA 6005 Phone : 08 9254 6900
Fax : 08 9322 1808 website : www.indmetops.com.au

Cobre Limited

CHECKED BY	A. Borger	23/05/2023	APPROVED	
DRAWN BY	L. Cherico	22/05/2023	CLIENT	

PROJECT: 6603 Ngami Copper Project

TITLE: Sighter Testwork Flowsheet

DRG No.	REV.	SIZE
DRG - 01	1	A3

APPENDIX B COMPOSITE INTERVAL DETAILS

Composite Interval Details

High Grade Composite Interval Summary

Interval ID	Hole ID	From	To	Interval	Mass	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Th	Ti	Tl	U	V	W	Zn
		m	m	m	kg	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
KML4351	NCP20A	148.7	149.4	0.7	1.51	20	3.32	25	640	5	10	0.41	5	20	70	11,500	3.59	25	3.9	25	1.32	400	5	1.15	30	770	20	0.16	25	10	30	25	0.37	25	25	100	25	190
KML4352	NCP20A	149.4	150.0	0.6	0.93	15	3.12	25	620	5	10	0.41	5	20	70	5,430	3.16	25	3.7	25	1.23	390	5	1.17	30	730	10	0.03	25	10	30	25	0.35	25	25	90	25	170
KML4353	NCP20A	150.0	151.0	1.0	2.26	15	4.39	25	650	5	10	0.73	5	20	60	5,860	3.58	25	3.8	25	1.32	550	5	1.12	20	800	10	0.09	25	10	30	25	0.35	25	25	90	25	180
KML4354	NCP20A	151.0	152.0	1.0	1.77	15	3.98	25	700	5	10	0.61	5	20	60	5,130	3.60	25	4.3	25	1.40	520	5	0.95	30	730	10	0.06	25	10	30	25	0.37	25	25	100	25	200
KML4355	NCP20A	152.0	152.9	0.9	1.33	20	3.76	25	640	5	10	0.4	5	20	60	8,040	3.49	25	4	25	1.31	420	5	1.05	30	750	10	0.14	25	10	30	25	0.38	25	25	100	25	200
KML4356	NCP20A	152.9	153.8	0.9	1.93	23	3.74	25	650	5	10	3.43	5	20	60	50,700	3.76	25	3.8	25	1.24	1370	5	0.66	30	620	20	1.02	25	10	60	25	0.3	25	25	90	25	180
KML4357	NCP20A	153.8	154.5	0.7	1.31	27	5.54	25	710	5	10	1.61	5	30	70	15,600	4.29	25	4.2	25	1.61	900	5	0.79	30	710	20	0.27	25	10	50	25	0.35	25	25	100	25	230
KML4358	NCP20A	154.5	155.3	0.8	2.55	29	5.31	25	720	5	10	1.51	5	20	70	10,400	4.23	25	4.2	25	1.51	880	5	0.82	40	790	30	0.20	25	10	50	25	0.34	25	25	110	25	220
KML4359	NCP20A	155.3	156.0	0.7	1.39	44	2.93	25	640	5	40	5.43	5	20	60	114,000	3.89	25	3.5	25	1.34	2270	5	0.69	30	520	40	2.38	25	10	130	25	0.26	25	25	90	25	220
KML4360	NCP20A	156.0	157.0	1.0	0.75	43	4.56	25	620	5	40	2.26	5	20	60	92,800	4.22	25	3.7	25	1.51	1000	5	0.64	30	600	40	1.83	25	10	40	25	0.28	25	25	100	25	240
High Grade Composite				**8.3**	**15.73**	**24**	**4**	**25**	**666**	**5**	**14**	**1.66**	**5**	**21**	**64**	**27,227**	**3.80**	**25**	**4**	**25**	**1.38**	**868**	**5**	**1**	**30**	**715**	**20**	**0.53**	**25**	**10**	**48**	**25**	**0**	**25**	**25**	**97**	**25**	**201**

Low Grade Composite Interval Summary

Interval ID	Hole ID	From	To	Interval	Mass	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Th	Ti	Tl	U	V	W	Zn
		m	m	m	kg	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
KML4243	NCP19	151.0	151.3	0.3	0.29	7	5.7	25	840	5	10	0.49	5	20	70	3,460	3.93	25	3.5	25	1.5	550	5	1.03	20	750	10	0.16	25	10	20	25	0.4	25	25	120	25	220
KML4244	NCP19	151.3	152.3	1.0	2.54	9	5.3	25	660	5	10	1.10	5	20	60	2,850	3.91	25	2.7	25	1.43	820	5	0.96	20	780	10	0.15	25	10	40	25	0.36	25	25	90	25	210
KML4245	NCP19	152.3	153.3	1.0	2.59	17	7.95	25	880	5	10	0.77	5	20	80	5,670	4.79	25	4.1	25	1.89	730	5	0.7	30	780	10	0.21	25	20	30	25	0.41	25	25	110	25	250
KML4246	NCP19	153.3	154.3	1.0	2.61	17	7.24	25	820	5	10	0.53	5	20	70	6,990	4.43	25	4.3	25	1.78	570	5	0.69	30	840	20	0.23	25	10	20	25	0.4	25	25	110	25	220
KML4247	NCP19	154.3	155.3	1.0	0.69	16	7.46	25	900	5	10	0.32	5	20	70	6,330	4.45	25	4.8	25	1.72	440	5	0.3	30	760	30	0.21	25	20	20	25	0.39	25	25	110	25	200
KML4250	NCP19	155.3	156.3	1.0	2.47	10	7.13	25	870	5	10	0.50	5	10	70	5,540	4.59	25	4.3	25	1.59	400	5	0.22	20	690	20	0.19	25	10	20	25	0.35	25	25	110	25	170
KML4251	NCP19	156.3	157.0	0.7	0.89	12	3.92	25	420	5	10	16.35	5	10	30	9,160	2.29	25	2	25	1.08	2830	5	0.44	10	500	50	0.31	25	10	400	25	0.19	25	25	50	25	110
Low Grade Composite				**6.0**	**12.07**	**13**	**7**	**25**	**785**	**5**	**10**	**1.85**	**5**	**17**	**67**	**5,577**	**4.26**	**25**	**4**	**25**	**1.63**	**780**	**5**	**1**	**24**	**752**	**18**	**0.20**	**25**	**13**	**54**	**25**	**0**	**25**	**25**	**102**	**25**	**205**

APPENDIX C HEAD ASSAY ANALYSIS

Client:	Cobre Ltd
Client ID:	6603
Date:	25/07/2023
Sample:	HG and LG Composite

Element	Unit	Detection Limit	Method	High Grade Composite	Low Grade Composite
Expected Cu	**%**			**2.72**	**0.56**
Cu	**ppm**	**10**	**4AH/OE**	**2.76**	**0.55**
Cu Residue	ppm	1	4ABRes/AA	602	242
Acid Soluble Cu	ppm	1	AS13/AA	2284	507
Cyanide Soluble Cu	ppm	2	CU7/AA	23132	4347
Cu Residue	% Total Cu			2.3%	4.7%
Acid Soluble Cu	% Total Cu			8.8%	9.9%
Cyanide Soluble Cu	% Total Cu			88.9%	85.3%
Au	ppm	0.005	FA25/OE	0.01	0.005
Ag	ppm	0.05	4A/MS	24.08	13.72
Al	ppm	50	4A/OE	77,544	80,388
As	ppm	0.5	4A/MS	4.1	3.3
Ba	ppm	0.1	4A/MS	756.2	856.2
Be	ppm	0.05	4A/MS	3.67	3.53
Bi	ppm	0.01	4A/MS	1.52	0.75
Carbon	%	0.01	/CSA	0.55	0.48
Non-Carbonate	%	0.01	C71/CSA	0.01	<0.01
Carbonate	%	0.01	/CALC	0.54	0.48
Ca	ppm	50	4A/OE	17,219	17,152
Cd	ppm	0.02	4A/MS	0.35	0.15
Ce	ppm	0.01	4A/MS	68.75	76.96
Cl	%	0.02	CL1/COL	<0.02	<0.02
Co	ppm	0.1	4A/MS	20.1	16.3
Cr	ppm	1	4A/OE	59	62
Cs	ppm	0.05	4A/MS	12	10.33
Sulphur	%	0.01	/CSA	0.65	0.12
Sulphate	%	0.01	S71/OE	0.01	<0.01
Sulphide	%	0.01	Calc	0.64	0.12
Fe	%	0.01	4A/OE	4.15	4.26
Ga	ppm	0.05	4A/MS	20.85	21.44
Ge	ppm	0.1	4A/MS	1.6	1.8
Hf	ppm	0.05	4A/MS	4.35	4.62
In	ppm	0.01	4A/MS	0.09	0.09
K	ppm	20	4A/OE	42,752	45,530
La	ppm	0.01	4A/MS	32.64	36.29
Li	ppm	0.1	4A/MS	42.7	42.1
Mg	ppm	20	4A/OE	16,793	15,823
Mn	ppm	1	4A/OE	877	787
Mo	ppm	0.1	4A/MS	0.7	0.7
Na	ppm	20	4A/OE	9,083	5,555
Nb	ppm	0.05	4A/MS	8.92	10.49
Ni	ppm	0.5	4A/MS	31.1	31.8
P	ppm	50	4A/OE	737	748
Pb	ppm	0.5	4A/MS	23	22.4
Rb	ppm	0.05	4A/MS	244.22	261.38
Re	ppm	0.002	4A/MS	<0.002	<0.002
Sb	ppm	0.05	4A/MS	1.81	1.48
Sc	ppm	0.1	4A/MS	14.9	15
Se	ppm	0.5	4A/MS	0.5	<0.5
Sn	ppm	0.1	4A/MS	4.4	4.3
Sr	ppm	0.05	4A/MS	49.69	50.29
Ta	ppm	0.01	4A/MS	0.74	0.85
Te	ppm	0.2	4A/MS	<0.2	<0.2
Th	ppm	0.01	4A/MS	8	9.58
Ti	ppm	5	4A/OE	3701	3892
Tl	ppm	0.02	4A/MS	1.56	1.72
U	ppm	0.01	4A/MS	2.02	3.03
V	ppm	1	4A/OE	99	105
W	ppm	0.1	4A/MS	2.6	2.9
Y	ppm	0.05	4A/MS	38.51	35.34
Zn	ppm	1	4A/MS	192	196
Zr	ppm	0.1	4A/MS	154.2	159.1

APPENDIX D LEACH TEST DATASHEETS

Client Code	M709	
Client	IMO-Cobre Limited	
Job Request	JR002	
Test Number	R1-1	
Sample	Composite High Grade	
Date	21/06/2023	
Entered/QAQC	AM	

Parameters		
HCL gpl	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient

Leach	Additions					Solution Data												
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	SG (g/cm^3)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5294.1	39981.0	30.9	63.9	1.0242	63.1	47.2	785	788	1.20	1.02	0	0.08	857.64	1810	0.36	0.8
2	-	5244.5	47.5	30.5	7.4	1.0264	63.3	46.3	368	425	1.20	1.05	0	0.11	1295.26	1838	0.40	1.3
6	-	5259.9	52.9	-	14.5	1.0291	66.8	53.3	394	394	1.13	1.00	0	0.14	1702.87	3194	0.62	1.3
24	-	5247.8	45.4	-	-	1.0278	63.7	42.7	342	342	1.00	1.00	0	0.21	2321.77	3537	0.81	2.0
48	-	5218.2	38.1	-	-	1.0312	63.3	45.4	325	325	0.98	0.98	0	0.26	2426.84	3505	0.90	2.4
72	-	5164.0	70.3	-	-	1.0287	67.9	53.0	312	312	1.01	1.01	0	0.38	2653.3	3670	1.46	4.0
144	-	5146.5	42.6	45.6	-	1.0253	63.5	44.4	302	410	1.08	1.08	0	0.37	2631.64	3529	1.03	3.6
168	-	5156.2	-	-	-	1.0444	4925.9	3556.1	391	391	1.02	1.02	0	0.42	3193.47	6074	1.45	3.8

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	46.0	0	0	0	0	4	4	321	325	39,482	39,482	3,444,840	3,484,322
2	45.1	0	0	0	0	5	9	436	445	58,365	97,847	5,139,527	5,237,374
6	51.8	0	0	0	0	7	16	557	573	88,147	185,994	6,771,173	6,957,167
24	41.6	0	0	0	0	9	25	835	859	96,548	282,542	9,228,479	9,511,021
48	44.0	0	0	0	0	11	36	1,025	1,061	106,751	389,293	9,567,914	9,957,207
72	51.6	0	0	0	0	20	56	1,475	1,530	136,779	526,072	10,296,582	10,822,654
144	43.3	0	0	0	0	16	72	1,433	1,504	114,013	640,085	10,189,131	10,829,216
168	3404.9	0	0		0	1,430	1,502		1,502	10,873,515	11,513,600		11,513,600

Recovery		
Ag	Co	Cu
%	%	%
0.0%	1.6%	13.7%
0.0%	2.2%	20.6%
0.0%	2.8%	27.4%
0.0%	4.2%	37.5%
0.0%	5.2%	39.3%
0.0%	7.6%	42.7%
0.0%	7.4%	42.7%
0.0%	7.4%	45.4%

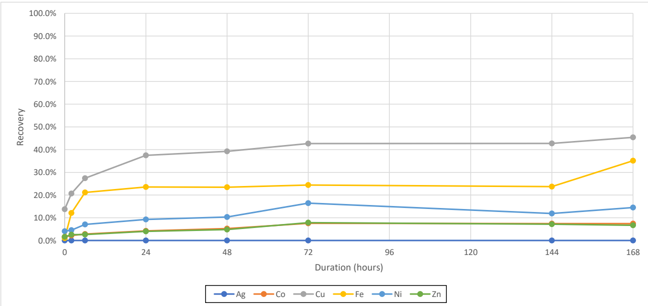
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	46.0	83,325	83,325	7,270,137	7,353,462	17	17	1,446	1,463	37	37	3,213	3,250
2	45.1	82,821	166,146	7,293,092	7,459,238	18	35	1,587	1,622	59	95	5,158	5,254
6	51.8	165,333	331,479	12,700,398	13,031,877	32	67	2,465	2,532	67	163	5,169	5,332
24	41.6	147,082	478,562	14,058,726	14,537,288	34	100	3,220	3,320	83	246	7,950	8,195
48	44.0	154,176	632,738	13,818,603	14,451,341	40	140	3,548	3,688	106	351	9,462	9,814
72	51.6	189,190	821,929	14,242,059	15,063,987	75	215	5,666	5,881	206	558	15,523	16,080
144	43.3	152,890	974,819	13,663,512	14,638,330	45	260	3,988	4,248	156	714	13,938	14,652
168	3404.9	20,681,493	21,656,312		21,656,312	4,937	5,197		5,197	12,939	13,652		13,652

Recovery		
Fe	Ni	Zn
%	%	%
1.0%	4.1%	1.6%
12.1%	4.5%	2.6%
21.1%	7.1%	2.6%
23.6%	9.3%	4.0%
23.4%	10.3%	4.8%
24.4%	16.4%	7.8%
23.7%	11.9%	7.1%
35.1%	14.5%	6.7%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	986.2	24	23,669	100.0%	19	18,738	92.6%	14044	13,850,193	54.6%	40600	40,039,720	64.9%	31	30,572	85.5%	194	191,323	93.3%
Solution Samples			0.0	0.0%		71.7	0.4%		640,085	2.5%		974,819	1.6%		260	0.7%		714	0.3%
Solution (ml), T=168	3404.9	0.000	0	0.0%	0.42	1,430	7.1%	3193.5	10,873,515	42.9%	6074	20,681,493	33.5%	1.450	4,937	13.8%	3.80	12,939	6.3%
Extraction				0%			7.4%			45.4%			35.1%			14.5%			6.7%
Total			23,669	100%		20,240	100%		25,363,793	100%		61,696,032	100%		35,769	100%		204,975	100%
Calculated Grade (ppm)			24.0			20.5			25,719			62,559			36.3			207.8	
Assay Grade (ppm)			24.1			20.1			27,569			41,500			31.1			192.0	

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR002
Test Number	R1-2
Sample	Composite Low Grade
Date	21/06/2023
Entered/QAQC	AM

Parameters		
HCL gpl	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient

Leach	Additions					Solution Data												
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	SG (g/cm^3)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5293.2	4000.5	30.9	67.8	1.0273	65.1	47.0	674	674	1.38	1.03	0	0.07	239.51	1776	0.33	0.7
2	-	5258.9	51.1	6.1	0.0	1.0229	68.3	46.9	430	444	1.06	1.06	0	0.1	460.35	1885	0.39	1.1
6	-	5249.1	35.6	0.0	11.4	1.0180	67.2	47.9	431	431	1.15	1.00	0	0.11	503.6	2116	0.46	1.3
24	-	5225.7	39.8	0.0	0.0	1.0232	65.8	45.0	410	410	1.03	1.03	0	0.15	599.87	2163	0.53	1.8
48	-	5194.9	41.2	0.0	0.0	1.0219	65.5	45.2	410	410	0.99	0.99	0	0.19	631.41	2267	0.62	2.2
72	-	5158.2	60.8	0.0	0.0	1.0162	64.3	46.2	407	407	1.00	1.00	0	0.27	674.31	2326	0.79	3.6
144	-	5129.4	48.8	0.0	0.0	1.0193	66.2	43.8	406	406	1.06	1.06	0	0.27	677.05	2293	0.76	3.3
168	-	5105.3	-	0.0	0.0	1.0217	4876.0	3556.1	408	408	1.03	1.03	0	0.27	669.54	2246	0.77	3.5

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	45.7	0	0	0	0	3	3	281	284	10,948	10,948	962,097	973,046
2	45.8	0	0	0	0	5	8	398	406	21,085	32,033	1,833,459	1,865,492
6	47.0	0	0	0	0	5	13	437	450	23,671	55,704	2,000,274	2,055,978
24	44.0	0	0	0	0	7	20	593	612	26,406	82,110	2,370,302	2,452,412
48	44.3	0	0	0	0	8	28	745	773	27,947	110,056	2,475,361	2,585,417
72	45.5	0	0	0	0	12	40	1,048	1,089	30,683	140,739	2,618,116	2,758,856
144	43.0	0	0	0	0	12	52	1,041	1,093	29,100	169,839	2,610,901	2,780,741
168	3480.6	0	0		0	940	992		992	2,330,382	2,500,221		2,500,221

Recovery		
Ag	Co	Cu
%	%	%
0.0%	1.9%	19.5%
0.0%	2.7%	37.3%
0.0%	3.0%	41.2%
0.0%	4.1%	49.1%
0.0%	5.2%	51.8%
0.0%	7.3%	55.2%
0.0%	7.3%	55.7%
0.0%	6.6%	50.0%

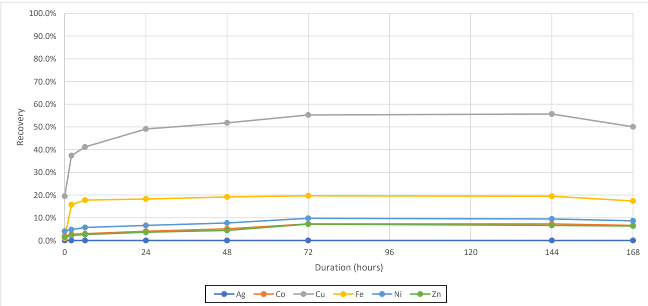
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	45.7	81,185	81,185	7,134,085	7,215,270	15	15	1,326	1,341	32	32	2,812	2,844
2	45.8	86,335	167,520	7,507,484	7,675,004	18	33	1,553	1,586	50	82	4,381	4,463
6	47.0	99,460	266,980	8,404,646	8,671,626	22	55	1,827	1,882	61	143	5,164	5,307
24	44.0	95,213	362,193	8,546,792	8,908,984	23	78	2,094	2,172	79	223	7,112	7,335
48	44.3	100,339	462,532	8,887,479	9,350,010	27	105	2,431	2,536	97	320	8,625	8,945
72	45.5	105,840	568,371	9,031,067	9,599,438	36	141	3,067	3,209	164	484	13,978	14,461
144	43.0	98,554	666,926	8,842,473	9,509,399	33	174	2,931	3,105	142	626	12,726	13,351
168	3480.6	7,817,364	8,484,289		8,484,289	2,680	2,854		2,854	12,182	12,808		12,808

Recovery		
Fe	Ni	Zn
%	%	%
1.0%	4.1%	1.4%
15.7%	4.8%	2.2%
17.8%	5.7%	2.6%
18.3%	6.6%	3.7%
19.2%	7.7%	4.5%
19.7%	9.8%	7.2%
19.5%	9.5%	6.7%
17.4%	8.7%	6.4%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	999.8	15	14,597	100.0%	14	13,997	93.4%	2496	2,495,501	50.0%	40300	40,291,940	82.6%	30	29,994	91.3%	188	187,962	93.6%
Solution Samples			0.0	0.0%		51.9	0.3%		169,839	3.4%		666,926	1.4%		174	0.5%		626	0.3%
Solution (ml), T=168	3480.6	0.000	0	0.0%	0.27	940	6.3%	669.5	2,330,382	46.6%	2246	7,817,364	16.0%	0.770	2,680	8.2%	3.50	12,182	6.1%
Extraction				0%			6.6%			50.0%			17.4%			8.7%			6.4%
Total			14,597	100%		14,989	100%		4,995,722	100%		48,776,229	100%		32,848	100%		200,770	100%
Calculated Grade (ppm)			14.6			15.0			4,997			48,786			32.9			200.8	
Assay Grade (ppm)			13.7			16.3			5,545			42,600			31.8			196.0	

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-1
Sample	Composite High Grade
Date	23/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient

Leach	Additions					Solution Data													
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	SG (g/cm^3)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5270.8	47.8	30.9	37.8	1.0231	61.2	47.8	455	497	1.53	1.01	0.000	0.08	1003	1667	0.40	0.0
2	-	5274.1	48.3	12.8	109.0	1.0225	59.5	48.6	406	451	1.53	1.00	0.002	0.11	1272.4	1662	0.40	1.0
6	-	5371.2	42.1	15.0	12.4	1.0420	53.6	41.9	422	451	1.19	1.05	0.003	0.19	1530.2	2361	0.60	2.0
24	-	5380.2	51.5	91.1	-	1.0536	68.8	51.5	377	450	0.70	0.70	0.000	0.3	2148.3	3182	0.90	3.0
48	-	5436.2	53.7	62.2	-	1.0622	69.8	51.4	422	450	0.71	0.71	0.000	0.5	3349.3	8061	2.00	4.0
120	-	5414.4	50.6	37.4	-	1.0798	71.2	50.9	442	450	0.80	0.80	0.000	0.84	3809.6	12590	3.20	6.0
144	-	5417.7	48.1	16.1	-	1.0796	71.2	49.7	445	450	0.35	0.35	0.001	0.94	3836.5	14356	3.60	7.0
168	-	5401.7	-	-	-	1.0874	5170.9	3775.5	425	425	0.64	0.64	0.000	1.07	3967.8	15425	4.00	7.0

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg	µg	µg	µg	µg	µg	µg	µg	µg	µg
0	46.7	0	0	0	0	4	4	319	323	46,861	46,861	4,004,177	4,051,038
2	47.5	0	0	8	8	5	9	439	448	60,478	107,339	5,082,856	5,190,195
6	40.2	0	0	12	13	8	17	779	795	61,531	168,870	6,271,525	6,440,395
24	48.9	0	0	0	0	15	31	1,229	1,261	104,968	273,838	8,803,562	9,077,400
48	48.4	0	0	0	0	24	55	2,077	2,132	162,073	435,911	13,912,992	14,348,903
120	47.1	0	0	0	0	40	95	3,471	3,567	179,614	615,525	15,743,896	16,359,421
144	46.0	0	0	4	4	43	138	3,889	4,027	176,651	792,176	15,872,329	16,664,505
168	3472.0		0	0	0		138	4,463	4,601		792,176	16,549,297	17,341,473

Recovery		
Ag	Co	Cu
%	%	%
0.0%	1.5%	14.4%
0.0%	2.0%	18.4%
0.1%	3.6%	22.8%
0.0%	5.7%	32.2%
0.0%	9.6%	50.8%
0.0%	16.1%	58.0%
0.0%	18.2%	59.0%
0.0%	20.8%	61.4%

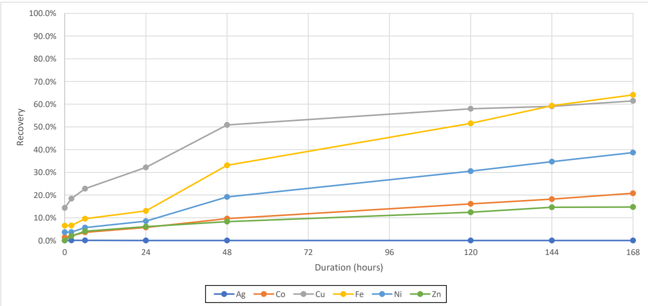
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg	µg	µg	µg	µg	µg	µg	µg	µg	µg
0	46.7	77,883	77,883	6,654,997	6,732,881	19	19	1,597	1,616	0	0	0	0
2	47.5	78,996	156,879	6,639,191	6,796,071	19	38	1,598	1,636	48	48	3,995	4,042
6	40.2	94,938	251,818	9,676,559	9,928,376	24	62	2,459	2,521	80	128	8,197	8,325
24	48.9	155,476	407,294	13,039,581	13,446,875	44	106	3,688	3,794	147	275	12,294	12,568
48	48.4	390,073	797,366	33,485,394	34,282,760	97	203	8,308	8,511	194	468	16,616	17,084
120	47.1	593,589	1,390,955	52,030,567	53,421,522	151	353	13,225	13,578	283	751	24,796	25,547
144	46.0	661,020	2,051,975	59,393,500	61,445,474	166	519	14,894	15,413	322	1,073	28,960	30,034
168	3472.0		2,051,975	64,336,133	66,388,107		519	16,684	17,203		1,073	29,196	30,270

Recovery		
Fe	Ni	Zn
%	%	%
6.5%	3.6%	0.0%
6.6%	3.7%	2.0%
9.6%	5.7%	4.1%
13.0%	8.5%	6.1%
33.1%	19.1%	8.3%
51.6%	30.5%	12.4%
59.3%	34.7%	14.6%
64.1%	38.7%	14.7%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	973.7	24	23,369	100.0%	18	17,527	79.2%	11174	10,880,124	38.6%	38200	37,195,340	35.9%	28	27,264	61.3%	180	175,266	85.3%
Solution Samples			0.0	0.0%		138.3	0.6%		792,176	2.8%		2,051,975	2.0%		519	1.2%		1,073	0.5%
Solution (ml), T=168	4170.9	0.000	0	0.0%	1.07	4,463	20.2%	3967.8	16,549,297	58.6%	15425	64,336,133	62.1%	4.000	16,684	37.5%	7.00	29,196	14.2%
Extraction				0%			20.8%			61.4%			64.1%			38.7%			14.7%
Total			23,369	100%		22,128	100%		28,221,597	100%		103,583,447	100%		44,466	100%		205,536	100%
Calculated Grade (ppm)		24.0			22.7			28,984			106,381			45.7			211.1		
Assay Grade (ppm)		24.1			20.1			27,569			41,500			31.1			192.0		

Value of 0 mg/l assumed for calculation



METALLURGY Quality Metallurgical Testwork	
Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-2
Sample	Composite High Grade
Date	23/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient
NaCl Addition (g)		131.90

Leach	Additions						Solution Data													
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	NaCl	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	(g)	SG (g/cm^3)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5425.2	51.8	30.9	131.9	28.1	1.0435	62.9	51.8	483	472	1.54	1.03	0.316	0.08	792.1	1692	0.30	0.0
2	-	5405.5	35.5	14.5	-	76.8	1.0435	48.5	35.7	370	455	1.47	1.09	0.233	0.11	1275.5	1789	0.40	0.0
6	-	5374.9	40.2	19.0	-	-	1.0578	51.4	40.2	391	450	1.02	1.02	0.206	0.2	1767.6	2548	0.70	2.0
24	-	5303.1	54.6	84.6	-	-	1.0604	69.7	52.9	348	451	1.74	0.74	0.084	0.32	2525.9	3693	1.00	3.0
48	-	5269.0	53.2	74.9	-	-	1.0724	70.6	53.2	424	450	0.79	0.79	0.183	0.48	3623.4	8437	1.90	3.0
120	-	5180.6	51.4	38.8	-	-	1.0827	72.2	50.1	439	450	0.92	0.92	0.421	0.78	4398.3	12609	3.00	6.0
144	-	5174.0	55.0	31.3	-	-	1.0906	71.4	53.3	442	450	0.51	0.51	0.457	0.88	4619.4	14781	3.50	6.0
168	-	5170.7	-	-	-	-	1.1069	4939.2	3586.1	437	437	0.76	0.76	0.523	0.94	4794	16538	3.90	6.0

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	49.6	16	16	1,309	1,325	4	4	331	335	39,320	39,320	3,280,799	3,320,119
2	34.2	8	24	964	988	4	8	455	463	43,637	82,957	5,278,402	5,361,359
6	38.0	8	31	845	877	8	15	821	836	67,175	150,132	7,252,816	7,402,949
24	49.9	4	36	338	373	16	31	1,286	1,317	126,104	276,237	10,150,733	10,426,970
48	49.6	9	45	729	774	24	55	1,912	1,968	179,751	455,988	14,436,713	14,892,700
120	46.2	19	64	1,641	1,706	36	91	3,041	3,132	203,361	659,349	17,149,148	17,808,496
144	48.9	22	87	1,777	1,864	43	134	3,422	3,557	225,760	885,109	17,965,770	18,850,879
168	3239.8		87	2,060	2,147		134	3,703	3,837		885,109	18,884,525	19,769,634

Recovery		
Ag	Co	Cu
%	%	%
6.2%	1.5%	12.5%
4.6%	2.1%	20.2%
4.1%	3.8%	27.9%
1.7%	5.9%	39.2%
3.6%	8.8%	56.0%
7.9%	14.1%	67.0%
8.7%	16.0%	70.9%
10.0%	17.2%	74.4%

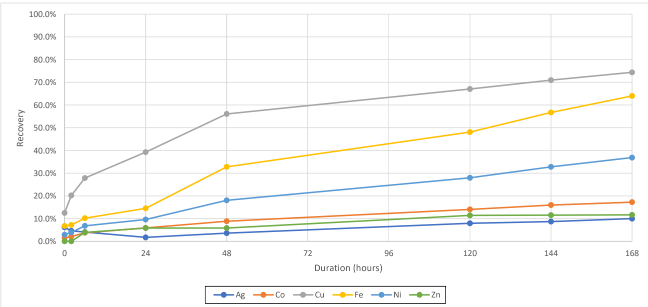
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	49.6	83,992	83,992	7,008,095	7,092,087	15	15	1,243	1,257	0	0	0	0
2	34.2	61,205	145,197	7,403,419	7,548,616	14	29	1,655	1,684	0	0	0	0
6	38.0	96,833	242,030	10,454,954	10,696,983	27	55	2,872	2,927	76	76	8,206	8,282
24	49.9	184,371	426,401	14,840,911	15,267,312	50	105	4,019	4,124	150	226	12,056	12,282
48	49.6	418,546	844,947	33,615,539	34,460,486	94	199	7,570	7,770	149	375	11,953	12,328
120	46.2	582,993	1,427,940	49,162,995	50,590,935	139	338	11,697	12,035	277	652	23,394	24,046
144	48.9	722,380	2,150,319	57,486,265	59,636,585	171	509	13,612	14,121	293	945	23,335	24,280
168	3239.8		2,150,319	65,146,490	67,296,809		509	15,363	15,872		945	23,635	24,580

Recovery		
Fe	Ni	Zn
%	%	%
6.7%	2.9%	0.0%
7.2%	3.9%	0.0%
10.2%	6.8%	3.9%
14.5%	9.6%	5.8%
32.8%	18.0%	5.8%
48.1%	28.0%	11.4%
56.7%	32.8%	11.5%
64.0%	36.9%	11.6%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	970.9	20	19,418	90.3%	19	18,447	82.8%	7007	6,803,096	25.6%	39000	37,865,100	36.0%	28	27,185	63.1%	192	186,413	88.4%
Solution Samples			22.3	0.1%		134.2	0.6%		885,109	3.3%		2,150,319	2.0%		509	1.2%		945	0.4%
Solution (ml), T=168	3939.2	0.523	2060	9.6%	0.94	3,703	16.6%	4794.0	18,884,525	71.1%	16538	65,146,490	61.9%	3.900	15,363	35.7%	6.00	23,635	11.2%
Extraction				10%			17.2%			74.4%			64.0%			36.9%			11.6%
Total			21,501	100%		22,284	100%		26,572,730	100%		105,161,909	100%		43,057	100%		210,993	100%
Calculated Grade (ppm)			22.1			23.0			27,369			108,314			44.3			217.3	
Assay Grade (ppm)			24.1			20.1			27,569			41,500			31.1			192.0	

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-3
Sample	Composite High Grade
Date	23/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient
NaCl Addition (g)		659.52

Leach	Additions						Solution Data												
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	NaCl	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	(g)	SG (g/cm³)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5933.9	57.8	30.9	659.5	8.7	1.1123	68.6	57.8	491	490	2.40	1.03	0.917	0.06	589.2	1670	0.30	0.0
2	-	5897.6	42.8	21.3	-	22.0	1.1125	54.4	42.4	326	454	2.79	1.06	1.634	0.08	1287.7	1290	0.30	0.0
6	-	5878.2	45.4	23.9	-	12.4	1.1146	58.7	45.6	349	451	1.22	1.03	1.789	0.13	1968.8	2818	0.60	0.0
24	-	5795.4	58.0	66.5	-	-	1.1238	73.0	57.3	340	453	0.84	0.84	1.809	0.21	2694.4	4134	0.90	1.0
48	-	5798.2	55.9	37.5	-	-	1.1287	74.8	55.9	435	452	0.92	0.92	1.877	0.34	3453.3	7885	1.60	2.0
120	-	5611.4	56.0	39.2	-	6.2	1.1346	74.9	56.1	436	451	1.16	1.01	2.032	0.49	4242.4	9770	2.10	3.0
144	-	5628.8	56.1	12.2	-	-	1.1408	74.3	56.1	447	451	0.61	0.61	2.038	0.58	4562.8	12371	2.60	3.0
168	-	5606.9	-	-	-	-	1.1464	5374.3	4009.7	461	461	0.89	0.89	2.160	0.62	4837.6	13419	2.80	3.0

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	52.0	48	48	4,258	4,306	3	3	279	282	30,617	30,617	2,735,950	2,766,568
2	38.1	62	110	7,553	7,663	3	6	370	376	49,077	79,695	5,952,522	6,032,217
6	40.9	73	183	8,229	8,413	5	11	598	609	80,547	160,241	9,056,480	9,216,721
24	51.0	92	275	8,151	8,426	11	22	946	968	137,309	297,551	12,139,700	12,437,251
48	49.5	93	368	8,465	8,833	17	39	1,533	1,572	171,089	468,640	15,573,278	16,041,918
120	49.4	100	469	8,784	9,253	24	63	2,118	2,181	209,690	678,330	18,338,707	19,017,037
144	49.2	100	569	8,845	9,414	29	92	2,517	2,609	224,340	902,670	19,803,054	20,705,724
168	3497.6		569	9,448	10,017		92	2,712	2,804		902,670	21,161,114	22,063,784

Recovery		
Ag	Co	Cu
%	%	%
18.7%	1.3%	9.7%
33.2%	1.7%	21.2%
36.5%	2.8%	32.3%
36.5%	4.4%	43.6%
38.3%	7.1%	56.3%
40.1%	9.9%	66.7%
40.8%	11.8%	72.7%
43.5%	12.7%	77.4%

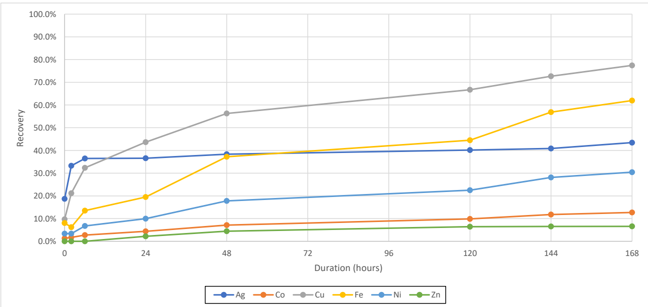
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	52.0	86,781	86,781	7,754,645	7,841,426	16	16	1,393	1,409	0	0	0	0
2	38.1	49,165	135,945	5,963,154	6,099,099	11	27	1,387	1,414	0	0	0	0
6	40.9	115,289	251,234	12,962,800	13,214,034	25	52	2,760	2,812	0	0	0	0
24	51.0	210,673	461,907	18,625,861	19,087,768	46	97	4,055	4,152	51	51	4,506	4,556
48	49.5	390,652	852,559	35,558,827	36,411,386	79	177	7,215	7,392	99	150	9,019	9,169
120	49.4	482,903	1,335,462	42,232,974	43,568,437	104	281	9,078	9,358	148	298	12,968	13,266
144	49.2	608,248	1,943,710	53,691,501	55,635,211	128	408	11,284	11,693	148	446	13,020	13,466
168	3497.6		1,943,710	58,698,732	60,642,442		408	12,248	12,656		446	13,123	13,569

Recovery		
Fe	Ni	Zn
%	%	%
8.0%	3.4%	0.0%
6.2%	3.4%	0.0%
13.5%	6.8%	0.0%
19.5%	10.0%	2.2%
37.2%	17.8%	4.4%
44.5%	22.5%	6.4%
56.8%	28.1%	6.5%
62.0%	30.4%	6.6%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	964.6	14	13,504	58.6%	20	19,292	87.3%	6667	6,430,988	22.6%	38600	37,233,560	38.0%	30	28,938	69.6%	200	192,920	93.4%
Solution Samples			100.2	0.4%		91.8	0.4%		902,670	3.2%		1,943,710	2.0%		408	1.0%		446	0.2%
Solution (ml), T=168	4374.3	2.160	9448	41.0%	0.62	2,712	12.3%	4837.6	21,161,114	74.3%	13419	58,698,732	60.0%	2.800	12,248	29.4%	3.00	13,123	6.4%
Extraction				41%			12.7%			77.4%			62.0%			30.4%			6.6%
Total			23,053	100%		22,096	100%		28,494,772	100%		97,876,002	100%		41,594	100%		206,489	100%
Calculated Grade (ppm)		23.9			22.9			29,541			101,468			43.1			214.1		
Assay Grade (ppm)		24.1			20.1			27,569			41,500			31.1			192.0		

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-4
Sample	Composite High Grade
Date	23/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient

Leach	Additions						Solution Data													
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	$KMnO_4$	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	(g)	SG (g/cm^3)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5297.4	49.1	30.9	-	34.4	1.0171	60.5	49.1	483	470	1.44	1.06	0.062	0.08	683.8	1769	0.30	0.0
2	-	5124.1	40.5	-	13.9	59.1	1.0246	53.5	40.6	428	454	1.61	1.09	0.152	0.11	1150.7	1830	0.40	0.0
6	-	5114.6	42.2	-	18.1	-	1.0377	55.7	42.6	409	452	1.08	1.08	0.197	0.19	1523.7	1883	0.50	2.0
24	-	5102.4	53.7	-	41.8	-	1.0413	68.3	53.5	353	452	0.72	0.72	0.151	0.29	1941.9	1942	0.70	3.0
48	-	5081.6	53.5	-	40.0	-	1.0377	68.6	52.7	376	459	0.80	0.80	0.131	0.37	2396.7	1906	0.90	4.0
120	-	4985.6	52.9	-	35.8	-	1.0417	69.1	51.0	362	452	0.98	0.98	0.134	0.58	3099.2	2012	1.20	5.0
144	-	4993.9	53.4	-	23.5	-	1.0371	67.1	52.7	410	450	0.58	0.58	0.073	0.64	3387.6	1941	1.30	6.0
168	-	5001.6	-	-	-	-	1.0345	4770.4	3410.1	416	416	0.91	0.91	0	0.66	3647	1917	1.30	6.0

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	48.3	3	3	249	252	4	4	321	325	33,010	33,010	2,746,893	2,779,903
2	39.6	6	9	586	595	4	8	424	432	45,597	78,607	4,432,842	4,511,448
6	41.1	8	17	757	774	8	16	730	746	62,551	141,158	5,852,227	5,993,385
24	51.4	8	25	576	601	15	31	1,107	1,138	99,752	240,911	7,413,611	7,654,522
48	50.8	7	32	497	529	19	50	1,405	1,455	121,740	362,651	9,101,924	9,464,575
120	48.9	7	38	496	534	28	78	2,148	2,226	151,672	514,324	11,477,639	11,991,963
144	50.8	4	42	271	313	33	111	2,374	2,485	172,075	686,398	12,568,064	13,254,462
168	3296.4		42	0	42		111	2,488	2,599		686,398	13,750,649	14,437,047

Recovery		
Ag	Co	Cu
%	%	%
1.1%	1.6%	10.0%
2.6%	2.2%	16.2%
3.4%	3.7%	21.6%
2.6%	5.7%	27.6%
2.3%	7.3%	34.1%
2.3%	11.2%	43.2%
1.4%	12.5%	47.7%
0.2%	13.1%	52.0%

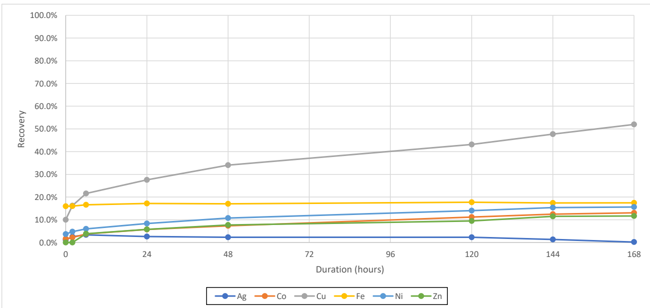
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	48.3	85,398	85,398	7,106,250	7,191,648	14	14	1,205	1,220	0	0	0	0
2	39.6	72,514	157,912	7,049,709	7,207,621	16	30	1,541	1,571	0	0	0	0
6	41.1	77,302	235,213	7,232,226	7,467,440	21	51	1,920	1,971	82	82	7,682	7,764
24	51.4	99,758	334,971	7,413,993	7,748,964	36	87	2,672	2,759	154	236	11,453	11,689
48	50.8	96,815	431,786	7,238,397	7,670,183	46	133	3,418	3,550	203	439	15,191	15,630
120	48.9	98,466	530,252	7,451,281	7,981,533	59	191	4,444	4,635	245	684	18,517	19,201
144	50.8	98,594	628,846	7,201,149	7,829,995	66	257	4,823	5,080	305	989	22,260	23,249
168	3296.4		628,846	7,227,857	7,856,703		257	4,902	5,159		989	22,622	23,611

Recovery		
Fe	Ni	Zn
%	%	%
16.0%	3.7%	0.0%
16.0%	4.8%	0.0%
16.6%	6.0%	3.8%
17.2%	8.4%	5.8%
17.0%	10.7%	7.7%
17.7%	14.0%	9.5%
17.4%	15.4%	11.5%
17.4%	15.6%	11.7%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	961.3	24	23,071	100.0%	18	17,303	86.9%	13879	13,341,883	48.0%	38700	37,202,310	82.6%	29	27,878	84.4%	186	178,802	88.3%
Solution Samples			3.7	0.0%		110.6	0.6%		686,398	2.5%		628,846	1.4%		257	0.8%		989	0.5%
Solution (ml), T=168	3770.4	0.000	0	0.0%	0.66	2,488	12.5%	3647.0	13,750,649	49.5%	1917	7,227,857	16.0%	1.300	4,902	14.8%	6.00	22,622	11.2%
Extraction				0%			13.1%			52.0%			17.4%			15.6%			11.7%
Total			23,075	100%		19,902	100%		27,778,930	100%		45,059,013	100%		33,037	100%		202,413	100%
Calculated Grade (ppm)		24.0			20.7			28,897			46,873			34.4			210.6		
Assay Grade (ppm)		24.1			20.1			27,569			41,500			31.1			192.0		

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-5
Sample	Composite High Grade
Date	30/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		70°C

Leach	Additions					Solution Data												
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	SG (g/cm³)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	500	4896.8	24.4	30.9	20.8	1.0362	37.0	27.0	394	450	1.87	0.95	0.004	0.28	2274.4	6013	1.30	2.0
2	-	4964.0	30.1	52.7	13.8	1.0583	41.2	29.4	384	452	1.26	1.02	0.037	0.63	3861.3	11046	2.60	4.0
6	-	4928.9	30.4	24.0	6.1	1.0617	41.0	28.4	425	450	1.17	1.06	0.054	0.9	5401.2	11350	3.10	6.0
24	-	4950.7	60.4	-	18.8	1.0693	41.4	25.3	464	464	1.32	1.04	0.138	1.41	5813.1	13180	4.10	11.0
48	-	5004.7	119.1	-	15.6	1.0893	41.4	26.8	469	469	1.19	0.90	0.105	2.24	6552.8	14860	5.60	19.0
120	-	5079.5	201.1	-	6.6	1.1094	43.4	25.0	489	489	1.13	1.07	0.052	3.95	7376.8	15345	8.60	34.0
144	-	5190.3	318.5	-	-	1.1048	44.1	25.0	492	492	1.05	1.05	0.044	3.9	6956.6	14389	8.30	33.0
168	-	4998.2	-	-	-	1.0922	2622.7	1721.8	497	497	1.11	1.11	0.024	3.7	6739.3	13559	7.90	31.0

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	26.0	0	0	8	8	7	7	558	566	59,242	59,242	4,535,859	4,595,100
2	27.8	1	1	76	77	18	25	1,297	1,322	107,268	166,510	7,950,687	8,117,197
6	26.7	1	3	109	112	24	49	1,823	1,871	144,480	310,990	10,937,646	11,248,636
24	23.7	3	6	283	289	33	82	2,890	2,973	137,594	448,584	11,916,332	12,364,916
48	24.6	3	8	221	229	55	137	4,709	4,847	161,038	609,622	13,776,672	14,386,294
120	22.5	1	10	113	123	89	226	8,607	8,834	165,968	775,590	16,074,637	16,850,227
144	22.6	1	11	101	111	88	314	8,931	9,245	157,166	932,756	15,929,779	16,862,535
168	1576.5		11	51	62		314	7,854	8,168		932,756	14,305,512	15,238,268

Recovery		
Ag	Co	Cu
%	%	%
0.1%	4.7%	29.5%
0.6%	11.0%	52.1%
0.9%	15.6%	72.2%
2.3%	24.8%	79.3%
1.8%	40.4%	92.3%
1.0%	73.7%	108.1%
0.9%	77.1%	108.2%
0.5%	68.2%	97.8%

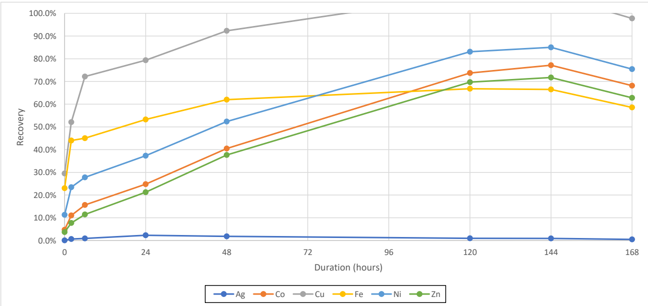
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	26.0	156,621	156,621	11,991,786	12,148,407	34	34	2,593	2,626	52	52	3,989	4,041
2	27.8	306,862	463,484	22,744,487	23,207,971	72	106	5,354	5,460	111	163	8,236	8,399
6	26.7	303,607	767,091	22,984,204	23,751,295	83	189	6,278	6,467	160	324	12,150	12,474
24	23.7	311,967	1,079,057	27,017,814	28,096,871	97	286	8,405	8,691	260	584	22,549	23,133
48	24.6	365,191	1,444,248	31,241,813	32,686,061	138	424	11,773	12,197	467	1,051	39,946	40,997
120	22.5	345,242	1,789,490	33,437,983	35,227,472	193	617	18,740	19,357	765	1,816	74,089	75,905
144	22.6	325,081	2,114,571	32,949,083	35,063,654	188	805	19,006	19,811	746	2,562	75,566	78,128
168	1576.5		2,114,571	28,781,689	30,896,260		805	16,769	17,574		2,562	65,804	68,365

Recovery		
Fe	Ni	Zn
%	%	%
23.0%	11.3%	3.7%
44.0%	23.4%	7.7%
45.0%	27.8%	11.5%
53.3%	37.3%	21.2%
62.0%	52.4%	37.6%
66.8%	83.1%	69.7%
66.5%	85.0%	71.7%
58.6%	75.4%	62.8%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	476.9	26	12,542	99.6%	8	3,815	31.8%	725	345,753	2.2%	45800	21,842,020	41.4%	12	5,723	24.6%	85	40,537	37.2%
Solution Samples			1.0	0.0%		314.3	2.6%		932,756	6.0%		2,114,571	4.0%		805	3.5%		2,562	2.4%
Solution (ml), T=168	2122.7	0.024	51	0.4%	3.70	7,854	65.5%	6739.3	14,305,512	91.8%	13559	28,781,689	54.6%	7.900	16,769	72.0%	31.00	65,804	60.4%
Extraction				0%			68.2%			97.8%			58.6%			75.4%			62.8%
Total			12,594	100%		11,983	100%		15,584,020	100%		52,738,280	100%		23,297	100%		108,902	100%
Calculated Grade (ppm)		26.4			25.1			32,678			110,586			48.9			228.4		
Assay Grade (ppm)		24.1			20.1			27,569			41,500			31.1			192.0		

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-6
Sample	Composite Low Grade
Date	23/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient

Leach	Additions					Solution Data													
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	SG (g/cm^3)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5295.8	41.1	30.9	28.4	1.0233	62.9	41.1	497	497	1.55	1.05	0.003	0.08	325.1	1689	0.40	0.0
2	-	5203.6	38.5	-	137.4	1.0224	56.4	38.5	471	471	1.50	1.06	0	0.1	463.6	1679	0.40	1.0
6	-	5304.2	42.6	-	-	1.0472	59.0	42.1	463	463	1.03	1.03	0.001	0.18	582.8	1823	0.60	2.0
24	-	5287.8	50.5	33.4	-	1.0541	70.9	49.8	424	453	0.60	0.60	0	0.27	681.3	1913	0.80	3.0
48	-	5290.3	49.3	-	-	1.0473	71.2	49.6	452	452	0.66	0.66	0.001	0.41	810.9	4032	1.30	4.0
120	-	5213.7	48.7	8.4	-	1.0473	72.4	47.6	447	453	0.77	0.77	0.001	0.7	946.5	4642	1.90	8.0
144	-	5208.3	50.0	-	-	1.0500	71.0	49.6	450	450	0.32	0.32	0.002	0.77	934.9	5077	2.10	8.0
168	-	5195.0	-	-	-	1.0488	4961.7	3491.2	425	425	0.63	0.63	0.001	0.79	751.7	4468	2.10	9.0

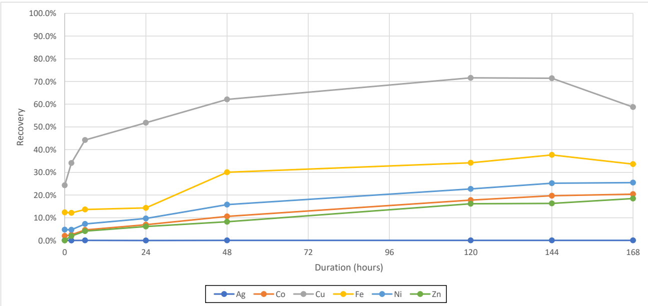
Time	Solution Data	Ag				Co				Cu				Recovery		
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total	Ag	Co	Cu
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg	%	%	%
0	40.2	0	0	12	12	3	3	322	325	13,057	13,057	1,307,357	1,320,415	0.1%	2.0%	24.3%
2	37.7	0	0	0	0	4	7	393	400	17,458	30,515	1,822,782	1,853,297	0.0%	2.5%	34.1%
6	40.2	0	0	4	4	7	14	725	739	23,430	53,945	2,347,985	2,401,930	0.0%	4.6%	44.2%
24	47.3	0	0	0	0	13	27	1,081	1,108	32,213	86,158	2,728,375	2,814,533	0.0%	7.0%	51.8%
48	47.3	0	0	4	4	19	46	1,643	1,689	38,365	124,524	3,249,641	3,374,165	0.0%	10.6%	62.1%
120	45.4	0	0	4	4	32	78	2,753	2,831	42,973	167,497	3,722,443	3,889,940	0.0%	17.8%	71.6%
144	47.2	0	0	8	8	36	115	3,023	3,137	44,172	211,669	3,669,847	3,881,516	0.1%	19.7%	71.4%
168	3328.8		0	4	4		115	3,130	3,244		211,669	2,978,010	3,189,679	0.0%	20.4%	58.7%

Time	Solution Data	Fe				Ni				Zn				Recovery		
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total	Fe	Ni	Zn
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg	%	%	%
0	40.2	67,837	67,837	6,792,145	6,859,982	16	16	1,609	1,625	0	0	0	0	12.4%	4.8%	0.0%
2	37.7	63,225	131,063	6,601,492	6,732,555	15	31	1,573	1,604	38	38	3,932	3,969	12.2%	4.7%	2.0%
6	40.2	73,289	204,352	7,344,502	7,548,854	24	55	2,417	2,473	80	118	8,058	8,176	13.6%	7.3%	4.1%
24	47.3	90,451	294,802	7,660,915	7,955,717	38	93	3,204	3,297	142	260	12,014	12,274	14.4%	9.7%	6.1%
48	47.3	190,763	485,565	16,158,038	16,643,603	62	155	5,210	5,364	189	449	16,030	16,479	30.0%	15.8%	8.3%
120	45.4	210,758	696,323	18,256,290	18,952,613	86	241	7,472	7,713	363	812	31,463	32,275	34.2%	22.7%	16.2%
144	47.2	239,876	936,199	19,929,205	20,865,404	99	340	8,243	8,583	378	1,190	31,403	32,593	37.7%	25.2%	16.3%
168	3328.8		936,199	17,700,876	18,637,075		340	8,320	8,660		1,190	35,655	36,846	33.6%	25.5%	18.5%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	975.0	13	12,675	100.0%	13	12,675	79.6%	2301	2,243,475	41.3%	37700	36,757,500	66.4%	26	25,350	74.5%	167	162,825	81.5%
Solution Samples			0.1	0.0%		114.5	0.7%		211,669	3.9%		936,199	1.7%		340	1.0%		1,190	0.6%
Solution (ml), T=168	3961.7	0.001	4	0.0%	0.79	3,130	19.7%	751.7	2,978,010	54.8%	4468	17,700,876	32.0%	2.100	8,320	24.5%	9.00	35,655	17.9%
Extraction				0%			20.4%			58.7%			33.6%			25.5%			18.5%
Total			12,679	100%		15,919	100%		5,433,154	100%		55,394,575	100%		34,010	100%		199,671	100%
Calculated Grade (ppm)		13.0			16.3			5,572			56,815			34.9			204.8		
Assay Grade (ppm)		13.7			16.3			5,545			42,600			31.8			196.0		

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-7
Sample	Composite Low Grade
Date	23/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient
NaCl Addition (g)		131.9

Leach	Additions						Solution Data													
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	NaCl	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	(g)	SG (g/cm³)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5428.2	53.1	30.9	131.9	48.0	1.0402	64.3	53.0	499	529	2.94	1.05	0.412	0.07	184.3	1730	0.30	0.0
2	-	5302.6	35.6	-	-	74.3	1.0392	48.7	35.6	486	483	1.63	1.09	0.626	0.09	532	1744	0.40	0.0
6	-	5260.4	39.5	-	-	-	1.0498	56.5	39.4	464	464	1.09	1.09	0.736	0.17	715.4	1992	0.50	2.0
24	-	5211.2	49.0	27.2	-	-	1.0525	71.4	49.1	425	453	0.75	0.75	0.718	0.24	817.1	2021	0.70	3.0
48	-	5109.9	52.4	-	-	-	1.0570	71.2	50.5	456	456	0.80	0.80	0.871	0.34	907.6	3825	1.10	3.0
72	-	5000.0	48.4	-	-	-	1.0539	72.5	46.7	450	450	0.95	0.95	1.208	0.53	1143.3	4362	1.50	5.0
144	-	4983.3	49.9	9.4	-	-	1.0514	72.1	48.8	446	450	0.57	0.57	1.329	0.59	1106.7	4356	1.60	6.0
168	-	4974.2	-	-	-	-	1.0532	4742.7	3298.0	448	448	0.82	0.82	1.401	0.59	923.8	4285	1.60	6.0

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	51.0	21	21	1,707	1,728	4	4	290	294	9,390	9,390	763,686	773,076
2	34.3	21	42	2,526	2,569	3	7	363	370	18,225	27,615	2,146,891	2,174,507
6	37.5	28	70	2,936	3,006	6	13	678	691	26,850	54,465	2,854,095	2,908,560
24	46.7	34	104	2,822	2,926	11	24	943	968	38,134	92,599	3,211,685	3,304,284
48	47.8	42	145	3,334	3,479	16	40	1,301	1,342	43,371	135,970	3,474,202	3,610,172
72	44.3	53	199	4,496	4,695	23	64	1,973	2,037	50,629	186,598	4,255,180	4,441,778
144	46.4	62	260	4,921	5,182	27	91	2,185	2,276	51,367	237,965	4,098,121	4,336,086
168	3131.4		260	5,244	5,504		91	2,208	2,300		237,965	3,457,515	3,695,481

Recovery		
Ag	Co	Cu
%	%	%
14.2%	1.8%	14.9%
21.1%	2.3%	41.9%
24.7%	4.3%	56.0%
24.1%	6.1%	63.6%
28.6%	8.4%	69.5%
38.6%	12.7%	85.5%
42.7%	14.2%	83.5%
45.3%	14.4%	71.2%

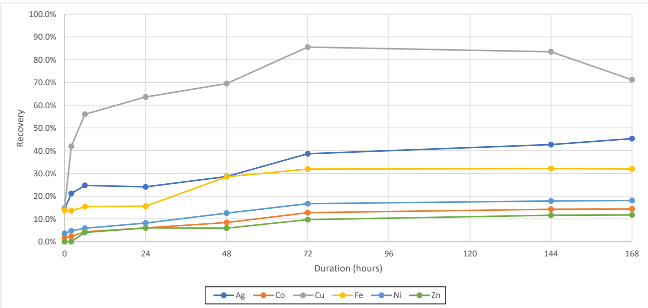
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	51.0	88,147	88,147	7,168,618	7,256,765	15	15	1,243	1,258	0	0	0	0
2	34.3	59,744	147,891	7,037,929	7,185,820	14	29	1,614	1,643	0	0	0	0
6	37.5	74,762	222,653	7,947,104	8,169,757	19	48	1,995	2,043	75	75	7,979	8,054
24	46.7	94,320	316,972	7,943,722	8,260,695	33	80	2,751	2,832	140	215	11,792	12,007
48	47.8	182,782	499,754	14,641,718	15,141,472	53	133	4,211	4,344	143	358	11,484	11,842
72	44.3	193,163	692,918	16,234,666	16,927,584	66	199	5,583	5,782	221	580	18,609	19,189
144	46.4	202,181	895,098	16,130,312	17,025,410	74	274	5,925	6,198	278	858	22,218	23,076
168	3131.4		895,098	16,037,512	16,932,611		274	5,988	6,262		858	22,456	23,315

Recovery		
Fe	Ni	Zn
%	%	%
13.7%	3.6%	0.0%
13.6%	4.7%	0.0%
15.4%	5.9%	4.1%
15.6%	8.2%	6.1%
28.6%	12.6%	6.0%
31.9%	16.7%	9.7%
32.1%	17.9%	11.6%
31.9%	18.1%	11.8%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	977.5	7	6,843	56.3%	14	13,685	85.6%	1532	1,497,530	28.8%	36900	36,069,750	68.1%	29	28,348	81.9%	179	174,973	88.2%
Solution Samples			61.7	0.5%		91.3	0.6%		237,965	4.6%		895,098	1.7%		274	0.8%		858	0.4%
Solution (ml), T=168	3742.7	1.401	5244	43.2%	0.59	2,208	13.8%	923.8	3,457,515	66.6%	4285	16,037,512	30.3%	1.600	5,988	17.3%	6.00	22,456	11.3%
Extraction				44%			14.4%			71.2%			31.9%			18.1%			11.8%
Total			12,148	100%		15,985	100%		5,193,011	100%		53,002,361	100%		34,610	100%		198,287	100%
Calculated Grade (ppm)		12.4			16.4			5,313			54,222			35.4			202.9		
Assay Grade (ppm)		13.7			16.3			5,545			42,600			31.8			196.0		

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-8
Sample	Composite Low Grade
Date	23/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient
NaCl Addition (g)		659.52

Leach	Additions						Solution Data												
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	NaCl	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	(g)	SG (g/cm^3)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5935.1	53.1	30.9	659.5	9.1	1.1148	66.3	53.1	522	526	2.51	1.03	1.056	0.06	213.7	1734	0.30	0.0
2	-	5802.1	44.4	-	-	20.5	1.1099	63.8	44.6	482	486	2.33	1.07	1.852	0.08	535.3	1569	0.30	0.0
6	-	5635.4	42.7	-	-	7.7	1.1111	58.5	42.8	473	473	1.21	1.06	2.011	0.11	697	1870	0.40	0.0
24	-	5525.2	53.0	10.2	-	-	1.1181	75.8	52.2	444	455	0.83	0.83	2.075	0.14	800.5	1926	0.50	1.0
48	-	5484.3	54.4	-	-	-	1.1133	75.5	53.2	461	461	0.92	0.92	2.074	0.19	767.9	2506	0.60	2.0
120	-	5405.2	52.9	-	-	4.6	1.1121	75.5	51.6	452	452	1.17	1.03	2.194	0.26	934.9	2595	0.80	2.0
144	-	5390.0	52.6	6.5	-	-	1.1105	75.4	52.8	447	456	0.66	0.66	2.333	0.3	922.1	2550	0.80	3.0
168	-	5383.3	-	-	-	-	1.1114	5059.4	3743.0	466	466	0.94	0.94	2.317	0.32	939.2	3007	0.90	3.0

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	47.6	50	50	4,813	4,864	3	3	273	276	10,179	10,179	974,066	984,245
2	40.2	74	125	8,211	8,336	3	6	355	361	21,510	31,689	2,373,306	2,404,995
6	38.5	77	202	8,584	8,787	4	10	470	480	26,849	58,538	2,975,284	3,033,822
24	46.6	97	299	8,609	8,908	7	17	581	598	37,337	95,875	3,321,395	3,417,269
48	47.7	99	398	8,518	8,916	9	26	780	806	36,667	132,542	3,153,950	3,286,491
120	46.4	102	500	8,841	9,341	12	38	1,048	1,086	43,370	175,912	3,767,376	3,943,287
144	47.6	111	611	9,486	10,097	14	52	1,204	1,256	43,876	219,787	3,700,627	3,920,414
168	3367.8		611	9,406	10,016		52	1,299	1,351		219,787	3,812,588	4,032,376

Recovery		
Ag	Co	Cu
%	%	%
39.1%	1.6%	17.5%
67.0%	2.1%	42.9%
70.6%	2.8%	54.1%
71.6%	3.5%	60.9%
71.7%	4.8%	58.6%
75.1%	6.4%	70.3%
81.2%	7.4%	69.9%
80.5%	8.0%	71.9%

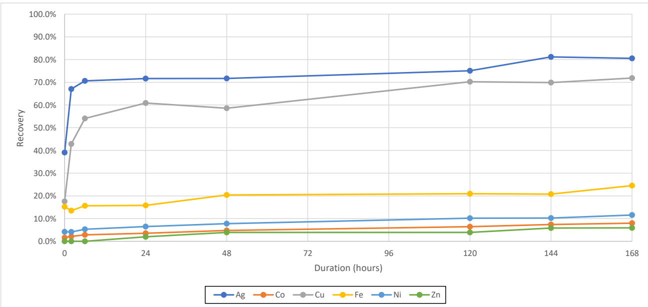
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	47.6	82,594	82,594	7,903,745	7,986,339	14	14	1,367	1,382	0	0	0	0
2	40.2	63,048	145,642	6,956,318	7,101,960	12	26	1,330	1,356	0	0	0	0
6	38.5	72,033	217,675	7,982,469	8,200,144	15	42	1,707	1,749	0	0	0	0
24	46.6	89,832	307,507	7,991,263	8,298,770	23	65	2,075	2,140	47	47	4,149	4,196
48	47.7	119,661	427,168	10,292,743	10,719,912	29	94	2,464	2,558	95	142	8,214	8,357
120	46.4	120,381	547,550	10,457,097	11,004,647	37	131	3,224	3,355	93	235	8,059	8,294
144	47.6	121,335	668,884	10,233,813	10,902,697	38	169	3,211	3,380	143	378	12,040	12,417
168	3367.8		668,884	12,206,616	12,875,500		169	3,653	3,822		378	12,178	12,556

Recovery		
Fe	Ni	Zn
%	%	%
15.2%	4.2%	0.0%
13.5%	4.1%	0.0%
15.6%	5.3%	0.0%
15.8%	6.5%	2.0%
20.4%	7.7%	3.9%
21.0%	10.2%	3.9%
20.8%	10.2%	5.9%
24.5%	11.6%	5.9%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	974.0	3	2,922	23.5%	16	15,584	92.0%	1621	1,578,854	28.1%	40700	39,641,800	75.5%	30	29,220	88.4%	205	199,670	94.1%
Solution Samples			111.0	0.9%		52.2	0.3%		219,787	3.9%		668,884	1.3%		169	0.5%		378	0.2%
Solution (ml), T=168	4059.4	2.317	9406	75.6%	0.32	1,299	7.7%	939.2	3,812,588	67.9%	3007	12,206,616	23.2%	0.900	3,653	11.1%	3.00	12,178	5.7%
Extraction				77%			8.0%			71.9%			24.5%			11.6%			5.9%
Total			12,439	100%		16,935	100%		5,611,230	100%		52,517,300	100%		33,042	100%		212,226	100%
Calculated Grade (ppm)			12.8			17.4			5,761			53,919			33.9			217.9	
Assay Grade (ppm)			13.7			16.3			5,545			42,600			31.8			196.0	

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-9
Sample	Composite Low Grade
Date	23/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		Ambient

Leach	Additions						Solution Data													
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	$KMnO_4$	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	(g)	SG (g/cm^3)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	1000	5298.6	47.8	30.9	-	34.9	1.0142	60.2	47.1	519	513	1.38	1.05	0.015	0.07	208.9	1785	0.30	0.0
2	-	5034.7	37.7	-	-	116.0	1.0145	53.0	37.8	478	483	1.50	1.08	0.020	0.11	487.6	1837	0.40	1.0
6	-	5102.6	39.7	-	-	3.3	1.0320	57.4	39.9	462	462	1.15	1.06	0.015	0.18	613.6	1847	0.50	2.0
24	-	5071.7	46.6	-	19.4	-	1.0383	71.6	46.5	423	455	0.63	0.63	0.006	0.29	692.1	1917	0.70	3.0
48	-	5037.1	49.3	-	6.6	-	1.0338	71.5	48.3	444	457	1.71	0.71	0.007	0.39	784.3	2063	1.00	5.0
120	-	4924.8	47.0	-	7.2	-	1.0356	71.5	46.7	442	455	0.85	0.85	0.010	0.65	907.6	2268	1.50	8.0
144	-	4915.2	47.0	-	-	-	1.0352	71.4	47.3	450	450	0.40	0.40	0.005	0.74	909.3	2376	1.70	9.0
168	-	4896.0	-	-	-	-	1.0359	4664.4	3185.4	430	430	0.71	0.71	0.004	0.79	797	2391	1.70	9.0

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	46.4	1	1	60	61	3	3	281	285	9,701	9,701	839,757	849,459
2	37.3	1	1	75	77	4	7	414	422	18,168	27,869	1,835,960	1,863,830
6	38.7	1	2	57	59	7	14	690	704	23,723	51,593	2,350,763	2,402,356
24	44.8	0	2	23	25	13	27	1,100	1,127	31,016	82,608	2,625,530	2,708,138
48	46.7	0	3	26	29	18	46	1,465	1,511	36,628	119,236	2,946,788	3,066,024
120	45.1	0	3	36	40	29	75	2,370	2,445	40,919	160,155	3,309,572	3,469,728
144	45.7	0	3	18	21	34	109	2,691	2,799	41,556	201,712	3,306,478	3,508,190
168	3075.0		3	15	18		109	2,895	3,004		201,712	2,920,527	3,122,238

Recovery		
Ag	Co	Cu
%	%	%
0.5%	1.7%	16.1%
0.6%	2.5%	35.3%
0.5%	4.2%	45.5%
0.2%	6.7%	51.3%
0.2%	9.0%	58.1%
0.3%	14.6%	65.7%
0.2%	16.7%	66.5%
0.1%	17.9%	59.2%

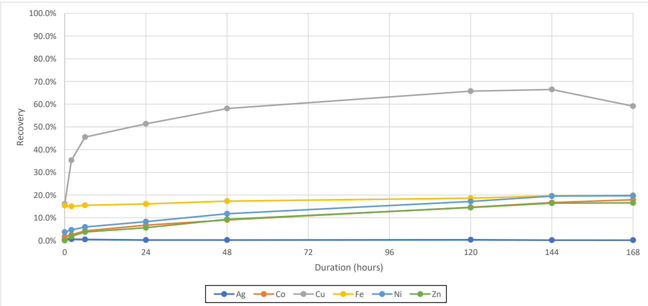
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	46.4	82,896	82,896	7,175,522	7,258,418	14	14	1,206	1,220	0	0	0	0
2	37.3	68,446	151,343	6,916,856	7,068,199	15	29	1,506	1,535	37	37	3,765	3,803
6	38.7	71,410	222,753	7,076,042	7,298,794	19	48	1,916	1,964	77	115	7,662	7,777
24	44.8	85,908	308,660	7,272,274	7,580,934	31	80	2,655	2,735	134	249	11,381	11,630
48	46.7	96,345	405,006	7,751,145	8,156,150	47	126	3,757	3,883	234	483	18,786	19,269
120	45.1	102,253	507,258	8,270,285	8,777,543	68	194	5,470	5,664	361	843	29,172	30,015
144	45.7	108,586	615,845	8,639,825	9,255,670	78	272	6,182	6,453	411	1,255	32,727	33,981
168	3075.0		615,845	8,761,580	9,377,425		272	6,229	6,501		1,255	32,980	34,234

Recovery		
Fe	Ni	Zn
%	%	%
15.4%	3.7%	0.0%
15.0%	4.7%	1.8%
15.5%	6.0%	3.8%
16.1%	8.3%	5.6%
17.3%	11.8%	9.3%
18.6%	17.2%	14.5%
19.7%	19.6%	16.4%
19.9%	19.7%	16.5%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	981.5	13	12,760	99.9%	14	13,741	82.1%	2196	2,155,374	40.8%	38400	37,689,600	80.1%	27	26,501	80.3%	176	172,744	83.5%
Solution Samples			0.2	0.0%		108.6	0.6%		201,712	3.8%		615,845	1.3%		272	0.8%		1,255	0.6%
Solution (ml), T=168	3664.4	0.004	15	0.1%	0.79	2,895	17.3%	797.0	2,920,527	55.3%	2391	8,761,580	18.6%	1.700	6,229	18.9%	9.00	32,980	15.9%
Extraction				0%			17.9%			59.2%			19.9%			19.7%			16.5%
Total			12,774	100%		16,745	100%		5,277,612	100%		47,067,025	100%		33,002	100%		206,978	100%
Calculated Grade (ppm)			13.0			17.1			5,377			47,954			33.6			210.9	
Assay Grade (ppm)			13.7			16.3			5,545			42,600			31.8			196.0	

Value of 0 mg/l assumed for calculation



Client Code	M709
Client	IMO-Cobre Limited
Job Request	JR004
Test Number	R2-10
Sample	Composite Low Grade
Date	30/08/2023
Entered/QAQC	AM

Parameters		
pH	Initial	1
	Maintained	1
Water		PTW
Grind Size (P100)		Pulp
Pulp Density (%solids)		20%
Temperature °C		70°C

Leach	Additions					Solution Data													
Time	Ore (solids)	Gross Mass	Water	Fe2(SO4)3	H2SO4	Solution	Slurry Mass	Filtrate Mass	EH Readings		pH		Ag	Co	Cu	Fe	Ni	Zn
(hours)	(g)	(g)	(g)	(g)	(g)	SG (g/cm^3)	(g)	(g)	(mV)	(mV)	Found	Left	ppm	ppm	ppm	ppm	ppm	ppm
0	500	4962.3	27.5	30.9	25.9	1.0183	38.3	22.7	479	479	1.82	1.01	0.059	0.17	656.2	3422	0.80	2.0
2	-	4970.5	32.5	-	18.0	1.0266	42.3	28.2	457	457	1.27	1.00	0.126	0.31	1228.5	4057	1.10	3.0
6	-	4977.2	48.8	-	6.5	1.0322	40.4	25.1	455	455	1.18	1.05	0.087	0.67	1575.9	4972	1.90	7.0
24	-	5114.7	174.1	-	18.8	1.0399	40.4	23.8	469	469	1.80	1.03	0.173	1.13	1259.6	4367	2.70	13.0
48	-	5063.2	121.8	-	18.5	1.0467	39.4	24.6	476	476	1.23	0.99	0.120	1.73	1287	5057	3.80	20.0
72	-	5070.4	125.1	-	23.0	1.0600	40.0	24.2	496	496	1.23	0.85	0.205	2.46	1276.1	5730	5.30	29.0
144	-	5047.9	126.0	-	-	1.0601	40.4	25.0	488	488	0.90	0.90	0.150	2.49	1195.8	5554	5.30	29.0
168	-	5061.8	-	-	-	1.0621	2624.5	1705.9	502	502	0.95	0.95	0.051	2.82	1306.4	6219	6.00	32.0

Time	Solution Data	Ag				Co				Cu			
	Sample	Ag	Ag Cumul'	Ag Vessel	Ag Total	Co	Co Cumul'	Co Vessel	Co Total	Cu	Cu Cumul'	Cu Vessel	Cu Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	22.2	1	1	118	119	4	4	340	344	14,596	14,596	1,313,942	1,328,538
2	27.4	3	5	253	257	9	12	622	634	33,686	48,282	2,463,241	2,511,523
6	24.3	2	7	175	182	16	29	1,350	1,378	38,367	86,649	3,175,092	3,261,741
24	22.9	4	11	373	383	26	54	2,434	2,488	28,865	115,514	2,712,687	2,828,201
48	23.5	3	14	252	266	41	95	3,635	3,730	30,235	145,749	2,704,412	2,850,161
72	22.8	5	18	432	451	56	151	5,188	5,339	29,134	174,883	2,691,180	2,866,063
144	23.6	4	22	313	335	59	210	5,193	5,403	28,166	203,049	2,494,008	2,697,057
168	1606.2		22	108	130		210	5,991	6,201		203,049	2,775,447	2,978,496

Recovery		
Ag	Co	Cu
%	%	%
2.1%	3.8%	43.6%
4.5%	7.0%	82.4%
3.2%	15.3%	107.1%
6.6%	27.6%	92.8%
4.6%	41.4%	93.5%
7.8%	59.2%	94.1%
5.8%	60.0%	88.5%
2.3%	68.8%	97.8%

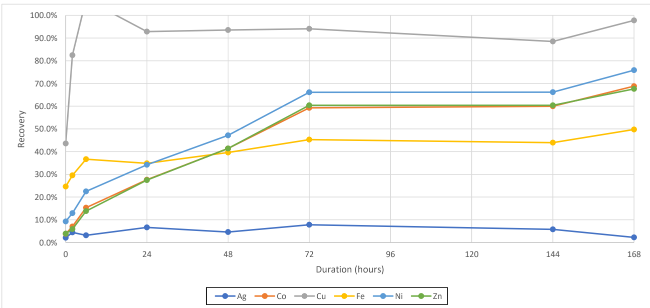
Time	Solution Data	Fe				Ni				Zn			
	Sample	Fe	Fe Cumul'	Fe Vessel	Fe Total	Ni	Ni Cumul'	Ni Vessel	Ni Total	Zn	Zn Cumul'	Zn Vessel	Zn Total
(hours)	(mL)	µg	µg	µg		µg	µg	µg	µg	µg	µg	µg	µg
0	22.2	76,115	76,115	6,852,042	6,928,157	18	18	1,602	1,620	44	44	4,005	4,049
2	27.4	111,245	187,361	8,134,610	8,321,970	30	48	2,206	2,254	82	127	6,015	6,142
6	24.3	121,049	308,409	10,017,486	10,325,896	46	94	3,828	3,922	170	297	14,103	14,401
24	22.9	100,073	408,482	9,404,815	9,813,297	62	156	5,815	5,971	298	595	27,997	28,592
48	23.5	118,804	527,286	10,626,426	11,153,711	89	245	7,985	8,230	470	1,065	42,027	43,092
72	22.8	130,817	658,103	12,084,054	12,742,157	121	366	11,177	11,544	662	1,727	61,158	62,885
144	23.6	130,821	788,924	11,583,645	12,372,568	125	491	11,054	11,545	683	2,410	60,484	62,894
168	1606.2		788,924	13,212,266	14,001,189		491	12,747	13,238		2,410	67,984	70,394

Recovery		
Fe	Ni	Zn
%	%	%
24.6%	9.3%	3.9%
29.6%	12.9%	5.9%
36.7%	22.5%	13.8%
34.9%	34.2%	27.5%
39.6%	47.2%	41.4%
45.3%	66.1%	60.4%
44.0%	66.1%	60.4%
49.7%	75.8%	67.6%

EXTRACTION CALCULATIONS

Product	Quantity	Ag			Co			Cu			Fe			Ni			Zn		
		Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib	Assay (ppm)	Mass (µg)	Distrib
Solids (g)	468.4	12	5,668	98.1%	6	2,810	31.2%	146	68,386	2.2%	30200	14,145,680	50.3%	9	4,216	24.2%	72	33,725	32.4%
Solution Samples			3.5	0.1%		209.9	2.3%		203,049	6.7%		788,924	2.8%		491	2.8%		2,410	2.3%
Solution (ml), T=168	2124.5	0.051	108	1.9%	2.82	5,991	66.5%	1306.4	2,775,447	91.1%	6219	13,212,266	46.9%	6.000	12,747	73.0%	32.00	67,984	65.3%
Extraction				2%			68.8%			97.8%			49.7%			75.8%			67.6%
Total			5,780	100%		9,011	100%		3,046,882	100%		28,146,869	100%		17,454	100%		104,119	100%
Calculated Grade (ppm)			12.3			19.2			6,505			60,092			37.3			222.3	
Assay Grade (ppm)			13.7			16.3			5,545			42,600			31.8			196.0	

Value of 0 mg/l assumed for calculation



APPENDIX L – METS Bottle Roll Testwork Progress Report

TECHNICAL FILE NOTE

Date	30/09/2024
From	Damian Connelly – Principal Consulting Engineer Shane Dempsey – Metallurgist Ana Ramirez – Process Engineer
To:	Cobre Limited Adam Wooldridge – Chief Executive Officer
Subject	J5945: Summary of Sighter Bottle Roll Test Results

1. Introduction

This technical note presents the results of the bottle roll leach tests conducted as a part of the long-term In-Situ Copper Recovery (ISCR) study. The objective of these tests was to validate historical leach testwork and optimize the leaching conditions for the long term ISCR.

A total of 30 samples from different intervals were collected from drill holes. Of these, five samples were selected for head assay, mineralogical analysis and for bottle roll leach tests. The remaining samples were reserved for the ISCR tests. The results for the mineralogical analysis will be presented in a separate technical file note.

The five samples tested are presented in Table 1 below. Sample N2126 was excluded from bottle roll testing due to insufficient mass.

Table 1: Sample Identification for Testing

Sample ID	Drill Hole
KML3131	NCP08
KML4330	NCP20A
KML2895	NCP45
KML2059	NCP33
N2126	NCP07

Previous leach testwork has been conducted on similar composite samples to evaluate potential copper recoveries using sulphuric acid leaching. Due to the presence of copper bearing sulphide minerals such as chalcocite within mineralisation, ferric sulphate was introduced into the leach conditions, aiming to oxidize these minerals and enhance copper extraction.

2. Key Findings

Copper Extraction:

- The potential copper recoveries achievable via sulphuric acid leaching were validated.
- The bottle roll tests revealed significant variations in copper extraction across the samples, with the highest extractions achieved in KML2059 (90.7%) and KML4330 (85.2%). The addition of NaCl to KML3131 improved copper extraction to 71.7%, while the non-chloride test of KML3131 achieved a slightly lower recovery of 64.7%.

Silver Extraction:

- Silver extraction was substantially higher for KML3131 with NaCl, achieving 53.1% extraction in the first 24 hours. The non-chloride version of KML3131 showed negligible silver recovery, indicating the importance of chloride addition for silver leaching. In contrast, the other samples (KML4330, KML2059, KML2895) showed virtually no silver recovery throughout the test duration, confirming that silver extraction strongly depends on chloride addition in these conditions.

Acid Consumption:

- Acid consumption was highest in the KML3131 test at 72 kg/t without chloride addition, in contrast with chloride addition acid consumption was 39 kg/t.

- The addition of ferric sulphate to the leach conditions, targeting the oxidation of copper sulphide minerals, was essential for enabling efficient extraction via acid in KML3131, KML3131 (with NaCl) and KML2895.

Chloride Effect:

- The tests demonstrated that the addition of NaCl enhances both copper and silver extraction for KML3131, although the reagent consumption is considerably higher. This highlights chloride's role in improving silver leaching and moderately aiding copper recovery.

3. Bottle Roll Tests

3.1 Samples and Preparation

- Four composites (KML3131, KML4330, KML2895, KML2059) were used for the non-chloride test, and one composite (KML3131 with chloride) was used for the chloride test.
- The samples arrived at -2mm crush size, prepared by another laboratory before arriving at ALS Balcatta.
- The samples were blended and rotary split producing sub samples for head assay, mineralogy and for indicative bottle roll leach tests.

3.2 Head Assay

Head assays for each sample were conducted to determine the initial metal content before leaching. Table 3-1 summarizes the elemental composition of each sample. Full results and analysis methods are presented in the appendix.

Table 3-1:Head Assay Results

Analyte	Ag (g/t)	Al (%)	Ca (%)	Co ppm	Cu (%)	Fe (%)	Mg (%)	Ni (ppm)	Si (%)
KML3131	26.0	8.00	0.500	20.0	1.83	4.08	1.67	30.0	27.5
KML4330	8.00	9.34	0.300	25.0	0.640	4.82	1.83	90.0	29.9
KML2895	18.0	7.73	1.20	20.0	1.04	4.20	1.61	35.0	29.3
KML2059	<2.0	7.24	0.400	20.0	0.670	3.68	1.32	80.0	30.5
N2126	18.0	8.71	0.300	25.0	0.470	4.38	1.67	30.0	27.5

3.3 Test Procedures

Leach Conditions

Bottle roll tests are standard laboratory tests which provide an indication to samples amenability to leaching. Each bottle is "rolled' for 1 minute every hour for the duration of the test. Figure 3-1 illustrates the equipment and set up of the tests.

Fig 3-1 Bottle Rolls Test Set-up

The bottle roll tests in this program were performed under the following conditions –

- **Feed Make-up:** 500 g of dry solids made up to 20% solids using Perth tap water (PTW).
- **pH Control:** The pH was adjusted to 1.0 using concentrated sulphuric acid (H_2SO_4).
- **Eh Control:** An oxidation-reduction potential (ORP) >550 mV was targeted, controlled using ferric sulphate ($Fe_2(SO_4)_3$) and hydrogen peroxide (H_2O_2).
- **Temperature:** The tests were conducted at ambient temperature.

Chloride Test:

- KML3131 (with chloride) was selected for a chloride-enhanced leach condition to compare its leaching behaviour with the non-chloride test.
- In addition to the above conditions, 50.0 g/L of chloride was added to the leach solution.
- The rest of the parameters, including pH (1.0) and Eh (550 mV), were kept consistent with the non-chloride test.

Sampling Frequency

- Samples of the leach solution were collected at 0, 2, 6, 24, 48, 72, 144, and 168 hours to evaluate the leach kinetics and elemental extraction over time.

pH and ORP Adjustments

- The pH was continuously monitored and adjusted using sulphuric acid to maintain the target pH of 1.0.
- ORP was controlled throughout the test using ferric sulphate and hydrogen peroxide to keep the redox potential around 550 mV.

Test Termination and Residue Handling

- The bottle roll test was terminated after 168 hours. Upon termination, the residue was processed as follows:
  - The solid residues (filter cake) were displacement washed with acidified DI water (pH 1.0) and then with DI water.
  - After washing, the solids were dried at 105°C and subsampled for analysis.
  - Both the solids and solutions were analysed to assess the final leaching performance.

Final Assay and Reporting

- The washed solids were weighed and assayed for remaining metal content, and the pregnant leach solution (PLS) was assayed to determine the concentration of extracted metals.

4. Results and Discussion

The bottle roll tests analyse the leaching performance of each sample. The following tables and graphs summarize the metal extraction percentages and reagent consumption for each sample. Full results are presented in the appendix.

Table 4-1: % Extraction Final Solution Metal vs Calc. Head

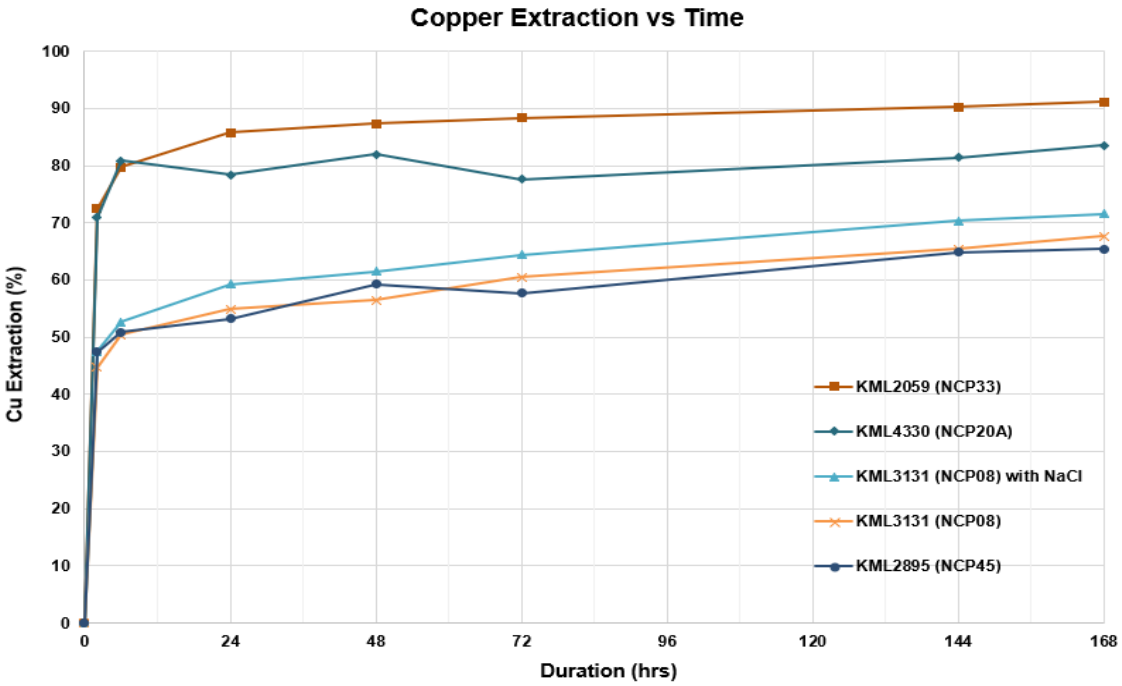
	% Extraction							
Sample/Metal	**Ag**	**Al**	**Ca**	**Co**	**Cu**	**Fe**	**Mg**	**Ni**
KML3131 *	53.10	1.23	77.38	0.22	71.66	<0.1	2.33	9.11
KML3131	4.76	1.11	84.14	<0.1	64.70	1.99	<0.1	1.41
KML4330	-	1.50	95.25	<0.1	85.19	7.28	<0.1	1.88
KML2059	-	3.07	87.52	<0.1	90.65	<0.1	<0.1	2.86
KML2895	-	1.14	47.02	<0.1	61.38	5.93	<0.1	<0.1

*KML3131- Chloride addition

4.1 Copper Extraction

Figure 4.1 illustrates total kinetics and overall copper recovery for each of the bottle roll tests.

Figure 4.1: Copper Extraction vs Time

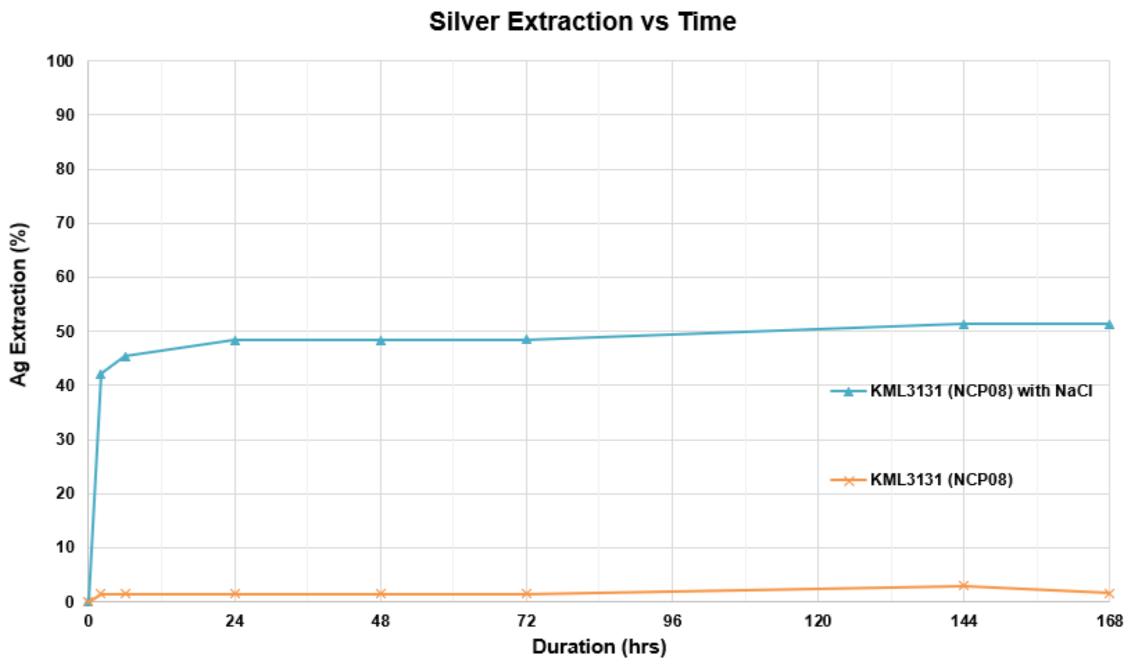


- Copper appears to still be leaching after 7 days in all tests, indicating the potential for ongoing recovery with extended leach times. This suggests that longer leaching durations may further enhance overall recovery, particularly for slower-leaching samples.
- KML2059 (NCP33) shows the best copper extraction, reaching 85% within 24 hours and stabilizing around 90% by 168 hours, indicating rapid and efficient leaching.
- KML4330 (NCP20A) achieves 78% extraction in the first 24 hours, with a final recovery of about 84%, but it plateaus after the initial fast phase.
- KML3131 (NCP08) with NaCl starts with 55% copper extraction at 24 hours, increasing gradually to 70% by 168 hours. NaCl supports a steady but slower leaching process.
- KML3131 (NCP08) without NaCl begins with a slightly slower extraction, reaching 50% at 24 hours and stabilizing between 65-70% by 168 hours, performing slightly worse without NaCl.
- KML2895 (NCP45) performs the poorest, starting with only 50% extraction in the first 24 hours and barely surpassing 65% by 168 hours, indicating slow kinetics and poor recovery.

4.2 Silver Extraction

Figure 4.2 illustrates the kinetics and overall silver recovery for the bottle roll for both KML3131 tests. The other test had negligible result are not presented.

Figure 4- 1: Silver Extraction vs Time



- KML3131 (NCP08) with NaCl reaches 53% silver extraction within the first 24 hours, but plateaus afterward, showing no significant increase throughout the rest of the test.
- KML3131 (NCP08) without NaCl shows minimal silver extraction, remaining close to 0% throughout the entire duration, indicating that NaCl plays a crucial role in silver leaching.

4.3 Reagent consumption

Reagent consumption was monitored for each of the tests and summarised in the Table 4-2 below. The full results can be found in the Appendix.

Table 4-2: Reagent Consumption

Sample ID	H_2SO_4 (kg/t)	H_2O_2 (kg/t)	Ferric Sulphate (kg/t)
KML3131 *	39	19	40
KML3131	72	51	40
KML4330	48	0	40
KML2059	58	0	40
KML2895	66	17	40

*KML3131- Chloride addition

- KML3131 without chloride addition showed the highest acid consumption at 72 kg/t where KML3131 with chloride addition was the least at 39 kg/t.
- Tests that consumed zero H_2O_2 indicate samples contained highly oxidised copper mineralisation, where samples that showed H_2O_2 consumption represents copper contained in sulphide minerals.

- KML4330 and KML2059 stand out for achieving high copper extractions with lower overall reagent consumption.

5. Summary

The bottle roll leach tests conducted as part of the In-Situ Copper Recovery (ISCR) study provided critical insights into the leaching behaviour of five samples from different drill holes. KML2059 achieved the highest copper extraction (90.7%) with minimal reagent consumption, indicating its suitability for the ISCR process. KML4330 also performed well, achieving 85.19% copper extraction with low reagent usage.

In contrast, KML3131 required chloride addition to enhance silver extraction and achieve moderate copper recovery (71.7%). The non-chloride version of KML3131 performed less effectively, showing slower copper kinetics and negligible silver recovery.

These results indicate that reagent consumption can be optimized depending on the ore's mineralogy, particularly when considering the use of NaCl to boost silver recovery. Samples like KML4330 and KML2059 suggest that efficient copper extraction can be achieved without additional oxidizing agents, making them ideal candidates for future ISCR optimization.

6. Way Forward

The next step in this study should focus on long-term leaching tests to confirm the initial findings from the bottle roll tests. Specifically:

- Leach Box tests will simulate in-situ leaching to assess fluid flow, metal recovery, and reagent consumption, providing long-term leaching kinetics and helping to optimize conditions for full-scale operations.
- KML2059 and KML4330, which showed high copper recoveries with low reagent consumption, are strong candidates for further evaluation in larger column or field tests.
- For samples like KML2895, where recovery was slower, further investigation into alternative oxidizing agents or extended leach times may improve performance.

7. Appendix A Test Results

JOB #	A25976
CLIENT	COBRE LIMITED
PROJECT	Cobre Copper ISL Program
METALLURGIST	Matthew Zanghi
START DATE	21/08/2024

ASSAY SUMMARY

SOLID ASSAYS

ANALYTE (dry basis)	METHOD	UNITS	N2126 RESI	KML3131 RESI	KML4330 RESI	KML2059 RESI	KML2895 RESI	HY18818 RESI	HY18819 RESI	HY18820 RESI	HY18821 RESI	HY18822 RESI
Ag	Digest/ICP	g/t	18.0	26.0	8.0	<2	18.0	12.0	26.0	6.0	<2	18.0
Al	Digest/ICP	%	8.62	8.24	8.83	7.32	7.70	8.26	8.34	8.86	7.39	7.72
Al	XRF	%	8.80	7.76	9.84	7.16	7.76	8.12	8.36	8.68	6.96	7.28
As	XRF	%	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01
Ba	Digest/ICP	ppm	725	600	705	745	1005	900	900	900	1000	1300
Be	Digest/ICP	ppm	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bi	Digest/ICP	ppm	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ca	Digest/ICP	%	0.28	0.48	0.28	0.35	1.15	0.09	0.08	0.02	0.05	0.55
Ca	XRF	%	0.30	0.50	0.40	0.40	1.20	0.13	0.09	0.01	0.05	0.65
Cd	Digest/ICP	ppm	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ce	Digest/ICP	ppm	91.0	54.0	86.0	93.0	83.0	7.0	4.0	30.0	48.0	12.0
Co	Digest/ICP	ppm	25.0	20.0	25.0	20.0	20.0	20.0	20.0	20.0	15.0	20.0
Co	XRF	%	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.002	0.003	0.003	0.004
Cr	Digest/ICP	ppm	90.0	80.0	80.0	80.0	90.0	70.0	60.0	70.0	60.0	70.0
Cs	Digest/ICP	ppm	14.0	20.0	16.0	10.0	12.0	18.0	20.0	14.0	10.0	10.0
Cu	Digest/ICP	%	0.48	1.92	0.61	0.70	1.10	0.53	0.68	0.10	0.07	0.37
Cu	XRF	%	0.46	1.74	0.67	0.64	0.98	0.55	0.68	0.09	0.06	0.40
Acid Sol. Cu	Digest/ICP	ppm	2352	1808	4974	6156	1104					
CN Sol. Cu	Digest/ICP	ppm	2514	16200	952	990	9192					
Dy	Digest/ICP	ppm	8.0	4.0	8.0	8.0	8.0	4.0	4.0	6.0	7.0	5.0
Er	Digest/ICP	ppm	4.0	2.0	5.0	5.0	4.0	2.0	2.0	4.0	4.0	4.0
Eu	Digest/ICP	ppm	2.0	<1	1.0	2.0	2.0	<1	<1	<1	1.0	<1
Fe	XRF	%	4.46	4.31	4.59	3.79	4.26	4.32	4.34	4.64	3.83	4.29
Fe	Digest/ICP	%	4.30	3.84	5.04	3.56	4.14	4.22	4.36	5.00	3.84	4.20

Ga	**Digest/ICP**	**ppm**	20.0	20.0	28.0	20.0	20.0	20.0	20.0	24.0	16.0	20.0
Gd	**Digest/ICP**	**ppm**	8.0	4.0	8.0	8.0	8.0	<4	<4	<4	8.0	<4
Hg	**Digest/ICP**	**ppm**	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.3	<0.1	<0.1	<0.1
Ho	**Digest/ICP**	**ppm**	1.6	0.8	1.6	1.6	1.6	0.8	0.8	1.2	1.2	1.2
K	**XRF**	**%**	4.85	5.51	5.04	3.95	4.33	5.52	5.61	5.15	4.09	4.37
K	**Digest/ICP**	**%**	4.80	5.00	5.40	3.80	4.20	5.60	5.80	5.20	4.20	4.40
La	**Digest/ICP**	**ppm**	48.0	28.0	41.0	45.0	40.0	3.0	2.0	6.0	34.0	5.0
Li	**Digest/ICP**	**ppm**	50.0	45.0	50.0	45.0	40.0	45.0	45.0	45.0	35.0	40.0
Lu	**Digest/ICP**	**ppm**	0.8	<0.4	0.4	0.8	0.8	<0.4	<0.4	0.4	0.4	0.4
Mg	**Digest/ICP**	**%**	1.68	1.74	1.73	1.32	1.58	1.67	1.71	1.62	1.34	1.55
Mg	**XRF**	**%**	1.72	1.60	1.92	1.32	1.64	1.68	1.76	1.72	1.36	1.56
Mn	**Digest/ICP**	**ppm**	335	270	310	690	490	200	300	400	400	400
Mo	**Digest/ICP**	**ppm**	<5	<5	10.0	<5	<5	30.0	40.0	10.0	5.0	20.0
Na	**Digest/ICP**	**ppm**	6320	2300	8580	7880	6060	2580	2580	9040	7660	6300
Nb	**Digest/ICP**	**ppm**	20.0	10.0	20.0	10.0	10.0	NR	NR	NR	NR	NR
Nd	**Digest/ICP**	**ppm**	44.0	25.0	39.0	42.0	39.0	4.0	2.0	8.0	35.0	6.0
Ni	**Digest/ICP**	**ppm**	50.0	30.0	90.0	80.0	50.0	35.0	30.0	30.0	25.0	30.0
Ni	**XRF**	**%**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
P	**Digest/ICP**	**ppm**	900	700	900	900	800	600	100	200	300	200
Pb	**Digest/ICP**	**ppm**	45.0	75.0	50.0	90.0	35.0	45.0	45.0	5.0	10.0	20.0
Pr	**Digest/ICP**	**ppm**	11.6	6.4	10.4	10.8	10.0	0.8	0.4	1.6	8.0	1.2
Rb	**Digest/ICP**	**ppm**	303	307	323	239	263	293	305	272	233	248
Re	**Digest/ICP**	**ppm**	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
S	**XRF**	**%**	0.06	0.43	<0.01	<0.01	0.24	0.41	0.44	0.01	0.01	0.68
Sb	**Digest/ICP**	**ppm**	0.5	1.8	1.0	0.8	1.4	1.8	1.8	0.9	0.7	1.5
Sc	**Digest/ICP**	**ppm**	6.0	6.0	6.0	4.0	6.0	14.0	16.0	16.0	12.0	12.0
Se	**Digest/ICP**	**ppm**	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Si	**XRF**	**%**	28.8	28.8	28.6	31.2	29.2	29.4	29.6	29.0	32.3	29.8
Si	**Digest/ICP**	**%**	28.6	26.2	31.1	29.7	28.6	29.2	30.1	29.5	31.9	29.3
Sm	**Digest/ICP**	**ppm**	9.0	5.0	8.0	9.0	9.0	2.0	1.0	3.0	7.0	2.0
Sn	**Digest/ICP**	**ppm**	<50	<50	<50	<50	100	<50	<50	<50	<50	<50
Sr	**Digest/ICP**	**ppm**	12.0	12.0	16.0	18.0	26.0	8.0	8.0	16.0	16.0	16.0
Ta	**Digest/ICP**	**ppm**	<2	<2	4.0	<2	2.0	<2	<2	2.0	<2	<2
Te	**Digest/ICP**	**ppm**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Th	**Digest/ICP**	**ppm**	14.0	6.0	8.0	16.0	10.0	4.0	4.0	6.0	10.0	6.0
Ti	**Digest/ICP**	**ppm**	5000	3400	5400	4400	4400	3600	3800	5000	4600	4600
Tl	**Digest/ICP**	**ppm**	2.0	2.0	2.0	2.0	2.0	NR	NR	NR	NR	NR
Tm	**Digest/ICP**	**ppm**	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
U	**Digest/ICP**	**ppm**	2.0	2.0	2.0	2.0	4.0	2.0	<2	<2	<2	<2

V	**Digest/ICP**	**ppm**	104	130	118	86.0	98.0	138	136	122	92.0	102
Y	**Digest/ICP**	**ppm**	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Yb	**Digest/ICP**	**ppm**	4.0	2.0	4.0	5.0	4.0	2.0	3.0	4.0	4.0	4.0
Zn	**Digest/ICP**	**ppm**	180	192	188	202	174	198	196	188	216	178
Zr	**Digest/ICP**	**ppm**	190	105	200	170	100	115	115	200	185	105

<1.0	Assay is less than the lower detection limit.
NR	Assay not reported

SOLUTION ASSAYS

ANALYTE (dil. basis)	METHOD	UNITS	HY18818 2 Hrs SA	HY18819 2 Hrs SA	HY18820 2 Hrs SA	HY18821 2 Hrs SA	HY18822 2 Hrs SA	HY18818 6 Hrs SA	HY18819 6 Hrs SA	HY18820 6 Hrs SA	HY18821 6 Hrs SA	HY18822 6 Hrs SA
Ag	**ICP**	**mg/L**	2.8	<0.2	<0.2	<0.2	<0.2	3.0	<0.2	<0.2	<0.2	<0.2
Al	**ICP**	**mg/L**	94.0	100	188	342	114	112	124	196	378	122
Ca	**ICP**	**mg/L**	720	670	270	435	800	760	675	315	465	750
Co	**ICP**	**mg/L**	1.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5
Cu	**ICP**	**mg/L**	2348	2132	1130	1260	1181	2592	2368	1290	1390	1257
Fe	**ICP**	**mg/L**	9976	10410	11060	10960	11080	10370	10710	10970	10970	10770
Mg	**ICP**	**mg/L**	280	70.0	108	132	106	300	88.0	118	142	118
Ni	**ICP**	**mg/L**	3.0	2.0	1.5	1.5	1.5	2.5	1.5	1.5	1.5	1.5
Dil. Factor *	**-**	**-**	none	none	none	none	none	none	none	none	none	none

ANALYTE (dil. basis)	METHOD	UNITS	HY18818 24 Hrs SA	HY18819 24 Hrs SA	HY18820 24 Hrs SA	HY18821 24 Hrs SA	HY18822 24 Hrs SA	HY18818 48 Hrs SA	HY18819 48 Hrs SA	HY18820 48 Hrs SA	HY18821 48 Hrs SA	HY18822 48 Hrs SA
Ag	**ICP**	**mg/L**	3.2	<0.2	<0.2	<0.2	<0.2	3.2	<0.2	<0.2	<0.2	<0.2
Al	**ICP**	**mg/L**	142.0	146	238	430	140	170	170	270	486	176
Ca	**ICP**	**mg/L**	795	720	460	540	705	785	705	630	660	650
Co	**ICP**	**mg/L**	1.5	<0.5	<0.5	<0.5	<0.5	1.0	<0.5	<0.5	<0.5	<0.5
Cu	**ICP**	**mg/L**	2920	2529	1249	1494	1312	3032	2601	1309	1525	1465
Fe	**ICP**	**mg/L**	10380	10740	11000	10890	10840	10340	10670	10990	11080	11020
Mg	**ICP**	**mg/L**	338	112.0	150	152	138	364	132.0	182	160	170
Ni	**ICP**	**mg/L**	5.0	2.0	2.0	1.5	2.0	2.5	1.5	1.5	1.0	1.5
Dil. Factor *	**-**	**-**	none	none	none	none	none	none	none	none	none	none

ANALYTE (dil. basis)	METHOD	UNITS	HY18818 72 Hrs SA	HY18819 72 Hrs SA	HY18820 72 Hrs SA	HY18821 72 Hrs SA	HY18822 72 Hrs SA	HY18818 144 Hrs SA	HY18819 144 Hrs SA	HY18820 144 Hrs SA	HY18821 144 Hrs SA	HY18822 144 Hrs SA
Ag	**ICP**	**mg/L**	3.20	<0.2	<0.2	<0.2	<0.2	3.40	0.20	<0.2	<0.2	<0.2
Al	**ICP**	**mg/L**	188	176	274	496	180	252	204	312	556	214
Ca	**ICP**	**mg/L**	775	685	675	710	615	795	635	705	695	590
Co	**ICP**	**mg/L**	1.50	0.50	<0.5	0.50	<0.5	2.00	0.50	0.50	<0.5	0.50
Cu	**ICP**	**mg/L**	3165	2781	1237	1543	1424	3476	3020	1301	1579	1607
Fe	**ICP**	**mg/L**	10010	10390	10610	11040	10940	10300	10730	10970	10740	10930
Mg	**ICP**	**mg/L**	336	142	184	168	176	456	170	230	190	220
Ni	**ICP**	**mg/L**	2.00	1.50	1.50	1.50	1.50	2.50	1.50	1.50	1.50	1.50
Dil. Factor *	**-**	**-**	none	none	none	none	none	none	none	none	none	none

ANALYTE (dil. basis)	METHOD	UNITS	HY18818 168 Hrs SA	HY18819 168 Hrs SA	HY18820 168 Hrs SA	HY18821 168 Hrs SA	HY18822 168 Hrs SA	HY18818 Final SA	HY18819 Final SA	HY18820 Final SA	HY18821 Final SA	HY18822 Final SA
Ag	**ICP**	**mg/L**	3.4	<0.2	<0.2	<0.2	<0.2	3.6	0.2	<0.2	<0.2	<0.2
Al	**ICP**	**mg/L**	260	226	328	566	224	264	238	334	572	214
Ca	**ICP**	**mg/L**	780	655	710	660	595	790	685	725	665	565
Co	**ICP**	**mg/L**	2.0	0.5	0.5	0.5	0.5	2.0	0.5	0.5	0.5	0.5
Cu	**ICP**	**mg/L**	3533	3118	1339	1595	1616	3596	3148	1341	1594	1493
Fe	**ICP**	**mg/L**	10130	10450	11180	10590	10920	10180	10670	11210	9723	10850
Mg	**ICP**	**mg/L**	456	196	256	202	228	478	204	256	202	210
Ni	**ICP**	**mg/L**	3.0	1.5	1.5	1.5	1.5	3.0	2.0	2.0	2.0	1.5
Dil. Factor *	**-**	**-**	none	none	none	none	none	none	none	none	none	none

ANALYTE (dil. basis)	METHOD	UNITS	HY18818 Wash SA	HY18819 Wash SA	HY18820 Wash SA	HY18821 Wash SA	HY18822 Wash SA					
Ag	**ICP**	**mg/L**	0.2	<0.2	<0.2	<0.2	<0.2					
Al	**ICP**	**mg/L**	22.0	18	24	26	16					
Ca	**ICP**	**mg/L**	180	320	70	140	525					
Co	**ICP**	**mg/L**	<0.5	<0.5	<0.5	<0.5	<0.5					
Cu	**ICP**	**mg/L**	215	230	102	74	115					
Fe	**ICP**	**mg/L**	572	754	791	432	714					
Mg	**ICP**	**mg/L**	34	18.0	22	12	20					
Ni	**ICP**	**mg/L**	<0.5	<0.5	<0.5	<0.5	<0.5					
Dil. Factor *	-	-	none	none	none	none	none	none	none	none	none	none

* Prior to submission to the Assay Lab

<1.0	Assay is less than the lower detection limit.
NR	Assay not reported

A25976 : COBRE LIMITED
Cobre Copper ISL Program

Test ID :	HY18818		
Test Description :	Acid Leach Bottle Roll		
Feed Sample :	KML3131	**Start Date :**	3/9/24
		Finish Date :	10/9/24
Feed to Leach (g) :	500.5 (100%)	**Duration (hrs) :**	168.0
PTW to Leach (g) :	1744.0	**pH target :**	1.0 (H2SO4)
		ORP target (mV) :	>550 (H2O2)

Additional Notes on Test:

Assay under detection; half LDL reported for mass balancing

Stage / Duration (hr)	Reactor Mass (before sampling) Bulk Slurry g	Bulk Solution g	Bulk Solid g	Sampling / Filtration / Washing Total Sample g	Solution Sample g	Solid Sample g	Slurry / Reactor Readings pH	ORP mV	Temp. °C	Reagents Added (before Reading) 98% H2SO4 g	30% H2O2 g	Ferric Sulphate g	99% NaCl g	DI Water g
Pre-Test	2502	2001	500.5			500.5	1.60					92.0	165	0
0	2515	2015		0.0	0.00	0	1.00	486	22.7	13.6	0			0
2	2515	2015		21.9	21.90	0	1.03	477	22.9	0	0			0
6	2514	2014		22.0	22.02	0	1.36	537	23.2	0	21.0			0
24	2497	1997		22.1	22.06	0	0.94	523	20.7	4.88	0			0
48	2479	1979		22.1	22.12	0	1.07	526	16.9	0	4.25			0
72	2462	1961		22.1	22.09	0	0.78	551	15.5	1.37	3.08			0
144	2440	1939		22.1	22.12	0	0.91	527	15.6	0	0			0
168	2421	1921		22.1	22.14	0	1.18	547	15.6	0	3.86			0
Final Bulk	2354	1690		2354	1690									
Wash Bulk		2970	478		2970	478								

Stage / Duration (hr)	Solution Wet Chemistry (at ambient temp. ~21°C) Sub Sample mL	Dilution for Assay v:v	Filtrate pH	Filtrate ORP mV	Filtrate Fe2+ mg/L		Filtrate Density kg/L		Solution Assays (corrected for dilution) Stage / Duration (min)	Ag mg/L	Al mg/L	Ca mg/L	Co mg/L	Cu mg/L	Fe mg/L	Mg mg/L	Ni mg/L	Si mg/L
Pre-Test		1.0					1.095		Pre-Test									
0	0.0	1.0					1.095		0									
2	20.0	1.0	1.01	484	3700		1.095		2	2.8	94.0	720	1.5	2348	9976	280	3.0	
6	20.0	1.0	1.32	539	600		1.101		6	3.0	112	760	1.5	2592	10370	300	2.5	
24	20.0	1.0	0.97	524	1200		1.103		24	3.2	142	795	1.5	2920	10380	338	2.5	
48	20.0	1.0	1.06	530	800		1.106		48	3.2	170	785	1.0	3032	10340	364	2.5	
72	20.0	1.0	0.81	554	500		1.104		72	3.2	188	775	1.5	3165	10010	336	2.0	
144	20.0	1.0	0.95	529	1100		1.106		144	3.4	252	795	2.0	3476	10300	456	2.5	
168	20.0	1.0	1.14	549	500		1.107		168	3.4	260	780	2.0	3533	10130	456	3.0	
Final Bulk	20.0	1.0	1.15	547	500		1.107		Final Bulk	3.6	264	790	2.0	3596	10180	478	3.0	
Wash Bulk	20.0	1.0	1.48	544	<100		1.101		Wash Bulk	0.2	22.0	180	0.25	215	572	34.0	0.25	

(1 = no dilution)

HY18818 Final Slurry

Final Slurry Mass (g)	2354
Primary Filtrate Mass (g)	1638
P.F. Wet Solids Mass (g)	663.1
Combined Wash (g)	2970.5
Damp Washed Solids Mass (g)	629.43
Washed Dry Solids Mass (g)	478.29
Feed % Solids	20.0
Final % Solids	20.32
Total Evaporative/Spillage Loss (%)	1.8

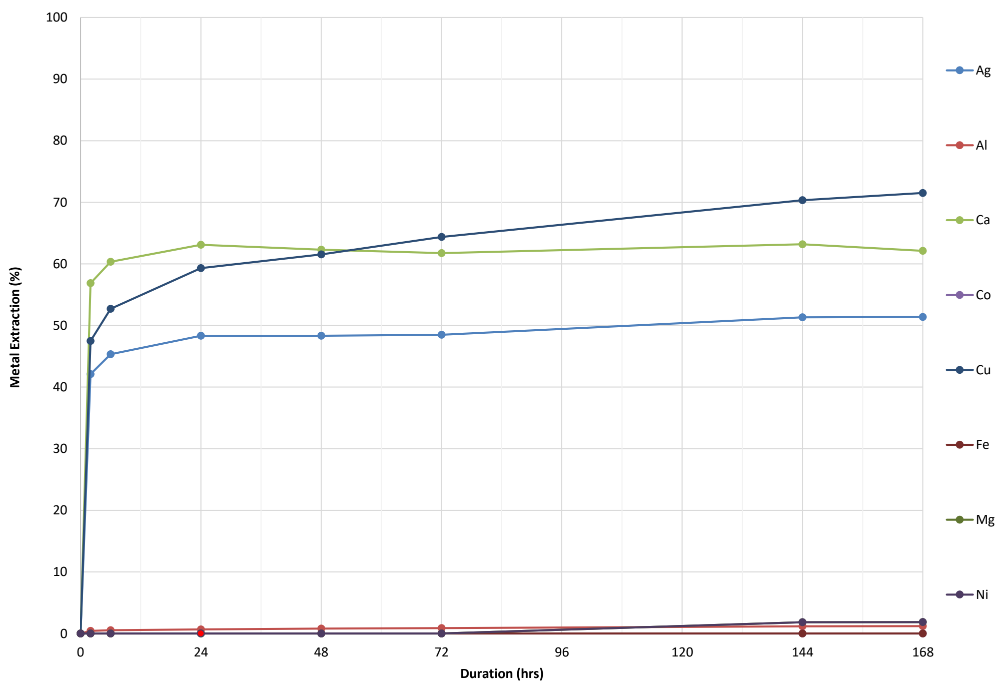
Additional Notes on Termination

Reagent Addition Rates

g H2SO4/kg feed	39	98.0%	purity
g H2SO4 added/g Cu in feed	2.1		
g H2O2/kg feed	19	30.0%	purity
g H2O2 added/g Cu in feed	1.1		
g Ferric/kg feed	40	22.0%	Fe grade in Ferric Sulphate reagent
g Ferric added/g Cu in feed	2.2		

Probe Calibrations

pH calibration buffers	7.0 and 4.0	
pH manual check	1.64	(vs pH 1.68 buffer)
ORP manual check	472	(vs 476mV at amb.)



Residue Assays

Sample ID	Ag g/t	Al %	Ca %	Co ppm	Cu %	Fe %	Mg %	Ni ppm	Si %
KML3131…	26.0	8.00	0.49	20.0	1.83	4.08	1.67	30.0	27.5
Ferric Sulph.	0	0.001	0.003	42.8	0.0001	22.00	0.74	42.8	0.001
Final	12.0	8.19	0.11	20.0	0.54	4.27	1.68	35.0	29.3

% Extraction (Interim Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	42.10	0.43	56.86	<0.1	47.49	<0.1	<0.1	<0.1	
6	45.33	0.52	60.33	<0.1	52.70	<0.1	<0.1	<0.1	
24	48.34	0.66	63.10	<0.1	59.31	<0.1	<0.1	<0.1	
48	48.33	0.79	62.31	<0.1	61.53	<0.1	<0.1	<0.1	
72	48.49	0.87	61.75	<0.1	64.36	<0.1	<0.1	<0.1	
144	51.32	1.15	63.19	<0.1	70.33	<0.1	1.83	1.83	
168	51.38	1.19	62.13	<0.1	71.51	<0.1	1.84	1.84	

% Extraction (Final Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash	53.10	1.23	77.38	0.22	71.66	<0.1	2.33	9.11	

% Extraction (Final Residue vs Feed)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash	55.89	2.17	78.55	4.44	71.86	<0.1	4.15	<0.1	<0.1

Accountability

Basis	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final vs Feed	94	99	95	97	99	96	98	118	102
	g/t	%	%	ppm	%	%	%	ppm	%
Calc'd Head	24	7.92	0.46	19	1.82	3.74	1.64	37	28.0
Assay Head	26	8.00	0.49	20	1.83	4.08	1.67	30	27.5

A25976 : COBRE LIMITED
Cobre Copper ISL Program

Test ID :	HY18819		
Test Description :	Acid Leach Bottle Roll		
Feed Sample :	KML3131	**Start Date :**	3/9/24
		Finish Date :	10/9/24
Feed to Leach (g) :	501.1 (100%)	**Duration (hrs) :**	168.0
PTW to Leach (g) :	1909.0	**pH target :**	1.0 (H2SO4)
		ORP target (mV) :	>550 (H2O2)

Additional Notes on Test:

Assay under detection; half LDL reported for mass balancing

	Reactor Mass (before sampling)			Sampling / Filtration / Washing			Slurry / Reactor Readings			Reagents Added (before Reading)				
Stage / Duration (hr)	Bulk Slurry g	Bulk Solution g	Bulk Solid g	Total Sample g	Solution Sample g	Solid Sample g	pH	ORP mV	Temp. °C	98% H2SO4 g	30% H2O2 g	Ferric Sulphate g	99% NaCl g	DI Water g
Pre-Test	2501	2000	501.1			501.1	1.80					90.5	0	0
0	2520	2019		0.0	0.00	0	1.08	480	23.7	19.9	0			0
2	2520	2019		20.8	20.83	0	1.10	474	25.2	0	0			0
6	2532	2031		20.9	20.88	0	1.22	530	22.6	1.49	30.5			0
24	2557	2055		20.9	20.90	0	1.00	528	20.4	4.75	41.0			0
48	2538	2037		20.9	20.94	0	1.08	528	17.0	0	2.85			0
72	2523	2022		20.9	20.93	0	0.85	551	15.5	1.66	3.67			0
144	2502	2001		20.9	20.94	0	1.61	524	17.0	0	0			0
168	2497	1996		21.1	21.05	0	0.91	550	15.3	8.95	6.71			0
Final Bulk	2300	1645		2300	1645									
Wash Bulk		2923	478		2923	478								

	Solution Wet Chemistry (at ambient temp. ~21°C)							
Stage / Duration (hr)	Sub Sample mL	Dilution for Assay v:v	Filtrate pH	Filtrate ORP mV	Filtrate Fe2+ mg/L		Filtrate Density kg/L	
Pre-Test		1.0					1.042	
0	0.0	1.0					1.042	
2	20.0	1.0	1.12	476	3200		1.042	
6	20.0	1.0	1.11	553	300		1.044	
24	20.0	1.0	1.03	539	600		1.045	
48	20.0	1.0	1.07	529	600		1.047	
72	20.0	1.0	0.85	552	300		1.046	
144	20.0	1.0	0.86	525	800		1.047	
168	20.0	1.0	0.63	555	300		1.053	
Final Bulk	20.0	1.0	0.64	553	300		1.054	
Wash Bulk	20.0	1.0	1.25	556	<100		1.005	

(1 = no dilution)

Solution Assays (corrected for dilution)

Stage / Duration (min)	Ag mg/L	Al mg/L	Ca mg/L	Co mg/L	Cu mg/L	Fe mg/L	Mg mg/L	Ni mg/L	Si mg/L
Pre-Test									
0									
2	0.1	100	670	0.3	2132	10410	70.0	2.0	
6	0.1	124	675	0.3	2368	10710	88.0	1.5	
24	0.1	146	720	0.3	2529	10740	112	2.0	
48	0.1	170	705	0.3	2601	10670	132	1.5	
72	0.1	176	685	0.5	2781	10390	142	1.5	
144	0.2	204	635	0.5	3020	10730	170	1.5	
168	0.1	226	655	0.5	3118	10450	196	1.5	
Final Bulk	0.2	238	685	0.5	3148	10670	204	2.0	
Wash Bulk	0.1	18.0	320	0.25	230	754	18.0	0.25	

HY18819 Final Slurry

Final Slurry Mass (g)	2300
Primary Filtrate Mass (g)	1661
P.F. Wet Solids Mass (g)	655.0
Combined Wash (g)	2922.5
Damp Washed Solids Mass (g)	639.07
Washed Dry Solids Mass (g)	478.16
Feed % Solids	20.0
Final % Solids	20.79
Total Evaporative/Spillage Loss (%)	6.7

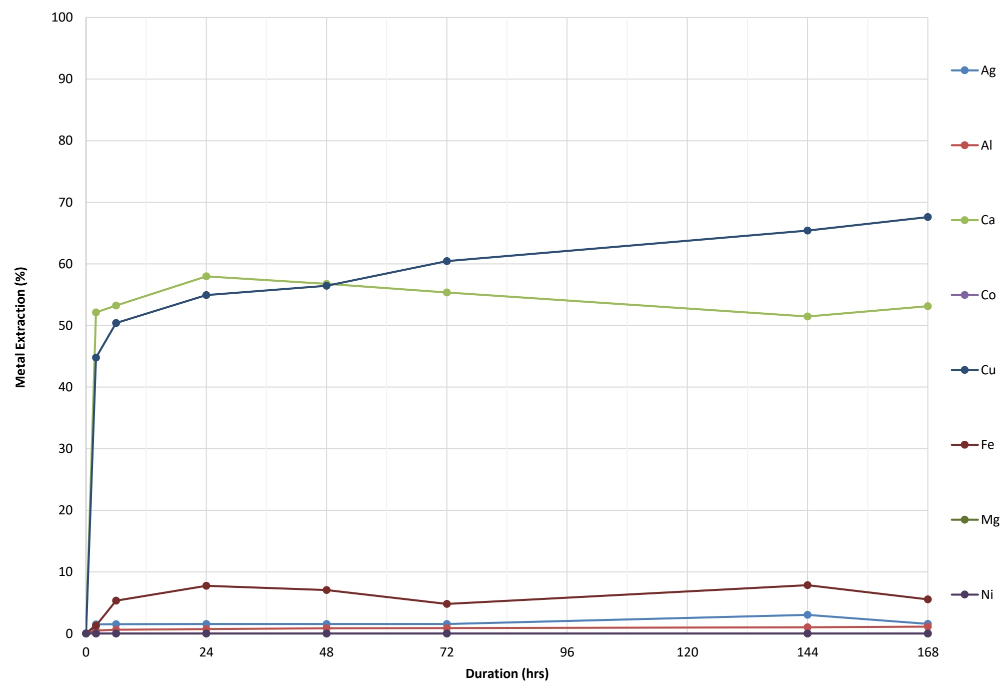
Additional Notes on Termination

Reagent Addition Rates

g H2SO4/kg feed	72	98.0% purity
g H2SO4 added/g Cu in feed	3.9	
g H2O2/kg feed	51	30.0% purity
g H2O2 added/g Cu in feed	2.8	
g Ferric/kg feed	40	22.0% Fe grade in Ferric Sulphate reagent
g Ferric added/g Cu in feed	2.2	

Probe Calibrations

pH calibration buffers	7.0 and 4.0	
pH manual check	1.64	(vs pH 1.68 buffer)
ORP manual check	472	(vs 476mV at amb.)



Residue Assays

Sample ID	Ag g/t	Al %	Ca %	Co ppm	Cu %	Fe %	Mg %	Ni ppm	Si %
KML3131...	26.0	8.00	0.49	20.0	1.83	4.08	1.67	30.0	27.5
Ferric Sulph.	0	0.001	0.003	42.8	0.0001	22.00	0.74	42.8	0.001
Final	26.0	8.35	0.08	20.0	0.68	4.35	1.74	30.0	29.9

% Extraction (Interim Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	1.49	0.48	52.13	<0.1	44.77	1.27	<0.1	<0.1	
6	1.51	0.60	53.23	<0.1	50.40	5.33	<0.1	<0.1	
24	1.54	0.72	57.97	<0.1	54.95	7.74	<0.1	<0.1	
48	1.54	0.84	56.76	<0.1	56.45	7.05	<0.1	<0.1	
72	1.54	0.87	55.37	<0.1	60.44	4.79	<0.1	<0.1	
144	3.02	1.00	51.46	<0.1	65.41	7.84	<0.1	<0.1	
168	1.56	1.11	53.12	<0.1	67.60	5.55	<0.1	<0.1	

% Extraction (Final Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash	4.76	1.11	84.14	<0.1	64.70	1.99	<0.1	1.41	

% Extraction (Final Residue vs Feed)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash	4.58	0.40	83.93	4.58	64.47	<0.1	0.86	4.58	<0.1

Accountability

Basis	Ag	Al	Ca	Co	Cu	Fe	Mg	Ni	Si
	%	%	%	%	%	%	%	%	%
Final vs Feed	100	101	101	80	101	102	96	97	104
	g/t	%	%	ppm	%	%	%	ppm	%
Calc'd Head	26	8.06	0.50	14	1.84	4.24	1.60	29	28.5
Assay Head	26	8.00	0.49	20	1.83	4.08	1.67	30	27.5

A25976 : COBRE LIMITED
Cobre Copper ISL Program

Test ID :	HY18820		
Test Description :	Acid Leach Bottle Roll		
Feed Sample :	KML4330	Start Date :	3/9/24
		Finish Date :	10/9/24
Feed to Leach (g) :	500.5 (100%)	Duration (hrs) :	168.0
PTW to Leach (g) :	1909.0	pH target :	1.0 (H2SO4)
		ORP target (mV) :	>550 (H2O2)

Additional Notes on Test:

Assay under detection; half LDL reported for mass balancing

Stage / Duration (hr)	Reactor Mass (before sampling): Bulk Slurry g	Bulk Solution g	Bulk Solid g	Sampling / Filtration / Washing: Total Sample g	Solution Sample g	Solid Sample g	Slurry / Reactor Readings: pH	ORP mV	Temp. °C	Reagents Added (before Reading): 98% H2SO4 g	30% H2O2 g	Ferric Sulphate g	99% NaCl g	DI Water g
Pre-Test	2501	2000	500.5			500.5	1.80					91.0	0	0
0	2516	2016		0.0	0.00	0	1.25	590	23.4	15.8	0			0
2	2516	2016		20.8	20.79	0	1.75	581	22.6	0	0			0
6	2502	2002		20.9	20.89	0	1.10	573	22.1	6.52	0			0
24	2484	1983		20.9	20.88	0	0.92	564	20.0	2.47	0			0
48	2463	1962		20.9	20.92	0	0.95	552	16.7	0	0			0
72	2442	1941		20.9	20.92	0	0.81	537	15.5	0	0			0
144	2421	1920		20.9	20.92	0	0.91	554	15.3	0	0			0
168	2400	1899		21.0	20.96	0	0.97	551	15.4	0	0			0
Final Bulk	2351	1681		2351	1681									
Wash Bulk		2947	483		2947	483								

Stage / Duration (hr)	Solution Wet Chemistry (at ambient temp. ~21°C): Sub Sample mL	Dilution for Assay v:v	Filtrate pH	Filtrate ORP mV	Filtrate Fe2+ mg/L	Filtrate Density kg/L
Pre-Test		1.0				1.039
0	0.0	1.0				1.039
2	20.0	1.0	1.22	577	200	1.039
6	20.0	1.0	1.07	575	100	1.044
24	20.0	1.0	0.93	571	200	1.044
48	20.0	1.0	0.98	554	200	1.046
72	20.0	1.0	0.85	559	300	1.046
144	20.0	1.0	0.78	554	300	1.046
168	20.0	1.0	0.84	555	300	1.048
Final Bulk	20.0	1.0	0.95	553	300	1.048
Wash Bulk	20.0	1.0	1.30	564	<100	1.004

(1 = no dilution)

Solution Assays (corrected for dilution): Stage / Duration (min)	Ag mg/L	Al mg/L	Ca mg/L	Co mg/L	Cu mg/L	Fe mg/L	Mg mg/L	Ni mg/L	Si mg/L
Pre-Test									
0									
2	0.1	188	270	0.3	1130	11060	108	1.5	
6	0.1	196	315	0.3	1290	10970	118	1.5	
24	0.1	238	460	0.3	1249	11000	150	2.0	
48	0.1	270	630	0.3	1309	10990	182	1.5	
72	0.1	274	675	0.3	1237	10610	184	1.5	
144	0.1	312	705	0.5	1301	10970	230	1.5	
168	0.1	328	710	0.5	1339	11180	256	1.5	
Final Bulk	0.1	334	725	0.5	1341	11210	256	2.0	
Wash Bulk	0.1	24.0	70.0	0.25	102	791	22.0	0.25	

HY18820 Final Slurry

Final Slurry Mass (g)	2351
Primary Filtrate Mass (g)	1600
P.F. Wet Solids Mass (g)	670.0
Combined Wash (g)	2947.4
Damp Washed Solids Mass (g)	655.95
Washed Dry Solids Mass (g)	482.60
Feed % Solids	20.0
Final % Solids	20.53
Total Evaporative/Spillage Loss (%)	1.1

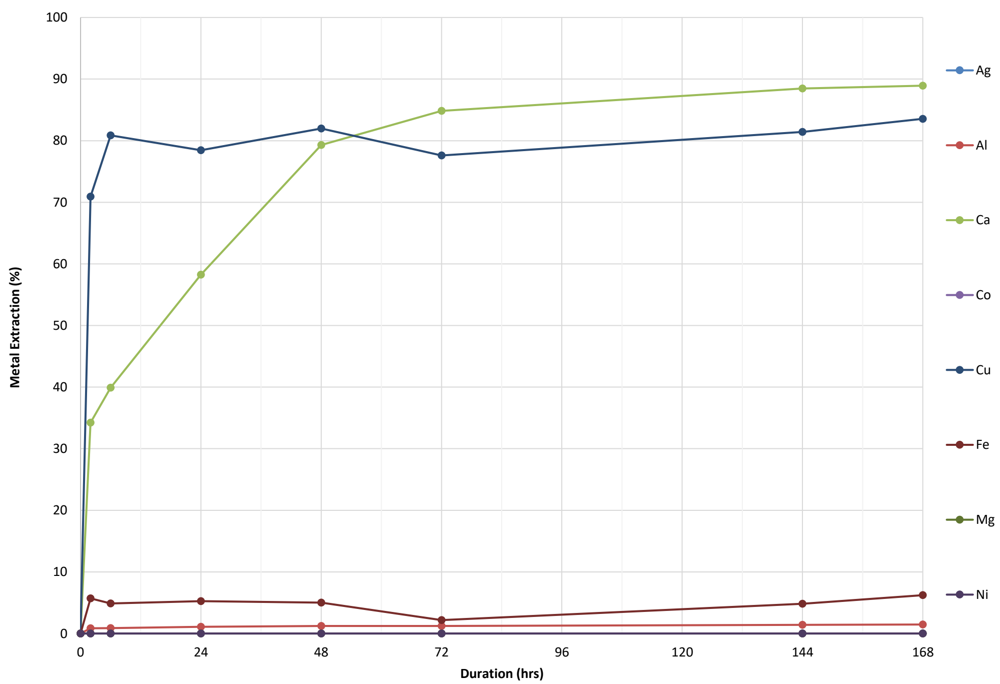
Additional Notes on Termination

Reagent Addition Rates

g H2SO4/kg feed	48	98.0% purity
g H2SO4 added/g Cu in feed	7.6	
g H2O2/kg feed	0	30.0% purity
g H2O2 added/g Cu in feed	0.0	
g Ferric/kg feed	40	22.0% Fe grade in Ferric Sulphate reagent
g Ferric added/g Cu in feed	6.3	

Probe Calibrations

pH calibration buffers	7.0 and 4.0	
pH manual check	1.64	(vs pH 1.68 buffer)
ORP manual check	472	(vs 476mV at amb.)



Residue Assays

Sample ID	Ag g/t	Al %	Ca %	Co ppm	Cu %	Fe %	Mg %	Ni ppm	Si %
KML4330…	8.00	9.34	0.34	25.0	0.64	4.82	1.83	90.0	29.9
Ferric Sulph.	0	0.001	0.003	42.8	0.0001	22.00	0.74	42.8	0.001
Final	6.00	8.77	0.02	20.0	0.09	4.82	1.67	30.0	29.3

% Extraction (Interim Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2		0.85	34.22	<0.1	70.93	5.71	<0.1	<0.1	
6		0.88	39.89	<0.1	80.85	4.88	<0.1	<0.1	
24		1.07	58.24	<0.1	78.44	5.25	<0.1	<0.1	
48		1.21	79.29	<0.1	81.97	5.01	<0.1	<0.1	
72		1.23	84.84	<0.1	77.61	2.18	<0.1	<0.1	
144		1.39	88.46	<0.1	81.42	4.81	<0.1	<0.1	
168		1.46	88.93	<0.1	83.55	6.22	<0.1	<0.1	

% Extraction (Final Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash		1.50	95.25	<0.1	85.19	7.28	<0.1	1.88	

% Extraction (Final Residue vs Feed)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash	27.68	9.41	95.75	22.86	85.69	3.48	11.77	67.86	5.51

Accountability

Basis	Ag	Al	Ca	Co	Cu	Fe	Mg	Ni	Si
	%	%	%	%	%	%	%	%	%
Final vs Feed	84	92	90	68	97	102	87	38	94
	g/t	%	%	ppm	%	%	%	ppm	%
Calc'd Head	7	8.59	0.30	15	0.62	5.01	1.58	29	28.2
Assay Head	8	9.34	0.34	25	0.64	4.82	1.83	90	29.9

A25976 : COBRE LIMITED
Cobre Copper ISL Program

Test ID :	HY18821		
Test Description :	Acid Leach Bottle Roll		
Feed Sample :	KML2059	**Start Date :**	3/9/24
		Finish Date :	10/9/24
Feed to Leach (g) :	500.5 (100%)	**Duration (hrs) :**	168.0
PTW to Leach (g) :	1909.5	**pH target :**	1.0 (H2SO4)
		ORP target (mV) :	>550 (H2O2)

Additional Notes on Test:

Assay under detection; half LDL reported for mass balancing

Stage / Duration (hr)	Reactor Mass (before sampling): Bulk Slurry g	Bulk Solution g	Bulk Solid g	Sampling / Filtration / Washing: Total Sample g	Solution Sample g	Solid Sample g	Slurry / Reactor Readings: pH	ORP mV	Temp. °C	Reagents Added (before Reading): 98% H2SO4 g	30% H2O2 g	Ferric Sulphate g	99% NaCl g	DI Water g
Pre-Test	2501	2001	500.5			500.5	1.80					91.0	0	0
0	2524	2023		0.0	0.00	0	1.08	700	24.0	22.6	0			0
2	2524	2023		20.8	20.83	0	1.05	715	22.9	0	0			0
6	2508	2008		20.9	20.95	0	1.05	732	21.9	5.37	0			0
24	2489	1988		20.9	20.93	0	0.93	731	20.1	1.74	0			0
48	2468	1968		21.0	20.97	0	1.01	724	16.8	0	0			0
72	2447	1947		21.0	20.96	0	0.78	705	15.2	0	0			0
144	2426	1926		21.0	20.97	0	0.90	722	15.2	0	0			0
168	2405	1905		21.0	20.97	0	1.04	709	15.2	0	0			0
Final Bulk	2337	1733		2337	1733									
Wash Bulk		2949	479		2949	479								

Stage / Duration (hr)	Solution Wet Chemistry (at ambient temp. ~21°C): Sub Sample mL	Dilution for Assay v:v	Filtrate pH	Filtrate ORP mV	Filtrate Fe2+ mg/L		Filtrate Density kg/L	
Pre-Test		1.0					1.041	
0	0.0	1.0					1.041	
2	20.0	1.0	1.13	687	<100		1.041	
6	20.0	1.0	1.03	671	<100		1.047	
24	20.0	1.0	0.93	715	<100		1.047	
48	20.0	1.0	1.00	720	<100		1.049	
72	20.0	1.0	0.84	718	<100		1.048	
144	20.0	1.0	0.78	699	<100		1.049	
168	20.0	1.0	0.85	694	<100		1.048	
Final Bulk	20.0	1.0	0.91	868	<100		1.049	
Wash Bulk	20.0	1.0	1.30	667	<100		1.003	

(1 = no dilution)

Solution Assays (corrected for dilution): Stage / Duration (min)	Ag mg/L	Al mg/L	Ca mg/L	Co mg/L	Cu mg/L	Fe mg/L	Mg mg/L	Ni mg/L	Si mg/L
Pre-Test									
0									
2	0.1	342	435	0.3	1260	10960	132	1.5	
6	0.1	378	465	0.3	1390	10970	142	1.5	
24	0.1	430	540	0.3	1494	10890	152	1.5	
48	0.1	486	660	0.3	1525	11080	160	1.0	
72	0.1	496	710	0.5	1543	11040	168	1.5	
144	0.1	556	695	0.3	1579	10740	190	1.5	
168	0.1	566	660	0.5	1595	10590	202	1.5	
Final Bulk	0.1	572	665	0.5	1594	9723	202	2.0	
Wash Bulk	0.1	26.0	140	0.25	73.6	432	12.0	0.25	

HY18821 Final Slurry

Final Slurry Mass (g)	2337
Primary Filtrate Mass (g)	1611
P.F. Wet Solids Mass (g)	604.0
Combined Wash (g)	2948.5
Damp Washed Solids Mass (g)	602.29
Washed Dry Solids Mass (g)	478.75
Feed % Solids	20.0
Final % Solids	20.49
Total Evaporative/Spillage Loss (%)	1.9

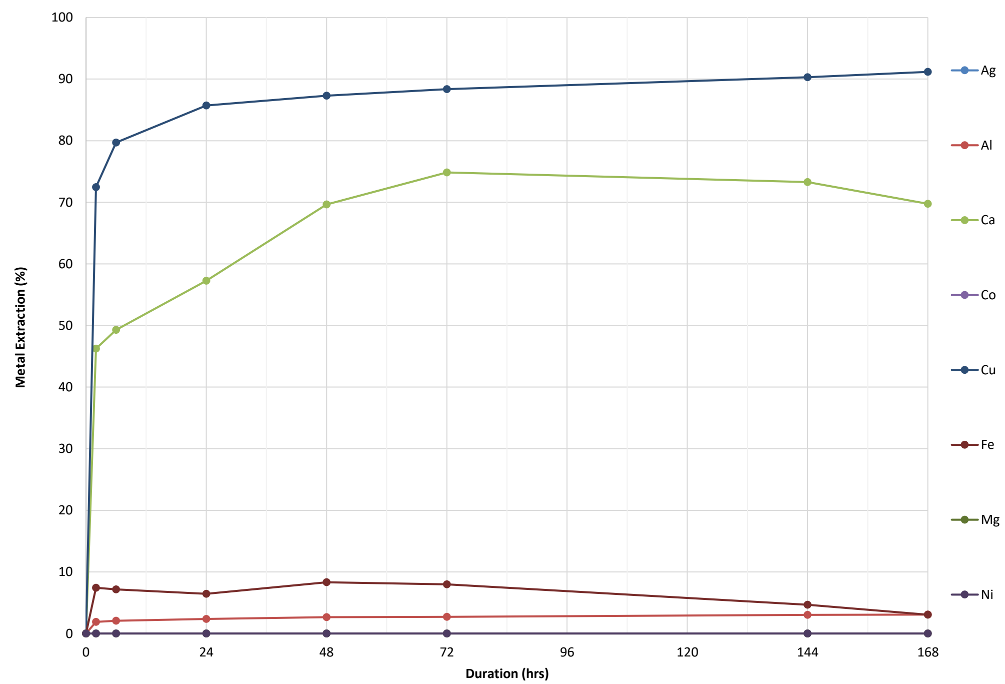
Additional Notes on Termination

Reagent Addition Rates

g H2SO4/kg feed	58	98.0% purity
g H2SO4 added/g Cu in feed	8.7	
g H2O2/kg feed	0	30.0% purity
g H2O2 added/g Cu in feed	0.0	
g Ferric/kg feed	40	22.0% Fe grade in Ferric Sulphate reagent
g Ferric added/g Cu in feed	6.0	

Probe Calibrations

pH calibration buffers	7.0 and 4.0	
pH manual check	1.64	(vs pH 1.68 buffer)
ORP manual check	472	(vs 476mV at amb.)



Residue Assays

Sample ID	Ag g/t	Al %	Ca %	Co ppm	Cu %	Fe %	Mg %	Ni ppm	Si %
KML2059…	1.0	7.24	0.38	20.0	0.67	3.68	1.32	80.0	30.5
Ferric Sulph.	0	0.001	0.003	42.8	0.0001	22.00	0.74	42.8	0.001
Final	1.0	7.18	0.05	15.0	0.07	3.84	1.35	25.0	32.1

% Extraction (Interim Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2		1.87	46.24	<0.1	72.45	7.41	<0.1	<0.1	
6		2.06	49.29	<0.1	79.69	7.15	<0.1	<0.1	
24		2.35	57.27	<0.1	85.73	6.45	<0.1	<0.1	
48		2.64	69.64	<0.1	87.30	8.31	<0.1	<0.1	
72		2.70	74.84	<0.1	88.36	7.97	<0.1	<0.1	
144		3.01	73.27	<0.1	90.29	4.65	<0.1	<0.1	
168		3.06	69.75	<0.1	91.17	3.06	<0.1	<0.1	

% Extraction (Final Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash		3.07	87.52	<0.1	90.65	<0.1	<0.1	2.86	

% Extraction (Final Residue vs Feed)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash	4.35	5.20	87.88	28.26	90.58	0.18	2.17	70.11	<0.1

Accountability

Basis	Ag	Al	Ca	Co	Cu	Fe	Mg	Ni	Si
	%	%	%	%	%	%	%	%	%
Final vs Feed	190	98	97	63	101	97	94	37	101
	g/t	%	%	ppm	%	%	%	ppm	%
Calc'd Head	2	7.08	0.36	10	0.67	3.43	1.23	25	30.7
Assay Head	1	7.24	0.38	20	0.67	3.68	1.32	80	30.5

A25976 : COBRE LIMITED
Cobre Copper ISL Program

Test ID :	HY18822		
Test Description :	Acid Leach Bottle Roll		
Feed Sample :	KML2895	**Start Date :**	3/9/24
		Finish Date :	10/9/24
Feed to Leach (g) :	501.0 (100%)	**Duration (hrs) :**	168.0
PTW to Leach (g) :	1910.5	**pH target :**	1.0 (H2SO4)
		ORP target (mV) :	>550 (H2O2)

Additional Notes on Test:
* Gaseous reaction observed upon adding solid to feed solution (before acid/H2O2 addition)

Assay under detection; half LDL reported for mass balancing

Stage / Duration (hr)	Reactor Mass (before sampling) Bulk Slurry g	Bulk Solution g	Bulk Solid g	Sampling / Filtration / Washing Total Sample g	Solution Sample g	Solid Sample g	Slurry / Reactor Readings pH	ORP mV	Temp. °C
Pre-Test	2503	2002	501			501.0	2.30		
0	2532	2031		0.0	0.00	0	1.02	503	25.0
2	2532	2031		20.9	20.86	0	1.04	474	23.2
6	2527	2026		20.9	20.85	0	1.10	541	22.6
24	2512	2011		20.9	20.88	0	0.92	540	20.3
48	2493	1992		20.9	20.90	0	1.00	538	16.8
72	2474	1973		20.9	20.89	0	0.83	555	15.2
144	2454	1953		20.9	20.90	0	0.98	538	15.3
168	2440	1939		20.9	20.88	0	1.02	571	15.2
Final Bulk	2371	1700		2371	1700				
Wash Bulk		3024	486		3024	486			

Stage / Duration (hr)	Reagents Added (before Reading) 98% H2SO4 g	30% H2O2 g	Ferric Sulphate g	99% NaCl g	DI Water g	Solution Wet Chemistry (at ambient temp. ~21°C) Sub Sample mL	Dilution for Assay v:v	Filtrate pH	Filtrate ORP mV	Filtrate Fe2+ mg/L		Filtrate Density kg/L	
Pre-Test			91.0	0	0		1.0					1.043	
0	29.3	0			0	0.0	1.0					1.043	
2	0	0			0	20.0	1.0	1.02	499	1800		1.043	
6	0	16.3			0	20.0	1.0	1.08	545	400		1.043	
24	4.42	1.66			0	20.0	1.0	0.92	555	300		1.044	
48	0	1.73			0	20.0	1.0	0.97	540	400		1.045	
72	0	2.07			0	20.0	1.0	0.85	557	200		1.045	
144	0	0			0	20.0	1.0	0.79	540	500		1.045	
168	0	7.05			0	20.0	1.0	0.85	576	200		1.044	
Final Bulk						20.0	1.0	0.95	570	200		1.045	
Wash Bulk						20.0	1.0	1.32	571	<100		1.005	

(1 = no dilution)

Solution Assays (corrected for dilution) Stage / Duration (min)	Ag mg/L	Al mg/L	Ca mg/L	Co mg/L	Cu mg/L	Fe mg/L	Mg mg/L	Ni mg/L	Si mg/L
Pre-Test									
0									
2	0.1	114	800	0.3	1181	11080	106	1.5	
6	0.1	122	750	0.3	1257	10770	118	1.5	
24	0.1	140	705	0.3	1312	10840	138	2.0	
48	0.1	176	650	0.3	1465	11020	170	1.5	
72	0.1	180	615	0.3	1424	10940	176	1.5	
144	0.1	214	590	0.5	1607	10930	220	1.5	
168	0.1	224	595	0.5	1616	10920	228	1.5	
Final Bulk	0.1	214	565	0.5	1493	10850	210	1.5	
Wash Bulk	0.1	16.0	525	0.25	115	714	20.0	0.25	

HY18822 Final Slurry

Final Slurry Mass (g)	2371
Primary Filtrate Mass (g)	1654
P.F. Wet Solids Mass (g)	670.5
Combined Wash (g)	3023.6
Damp Washed Solids Mass (g)	663.23
Washed Dry Solids Mass (g)	485.55
Feed % Solids	20.0
Final % Solids	20.48
Total Evaporative/Spillage Loss (%)	1.9

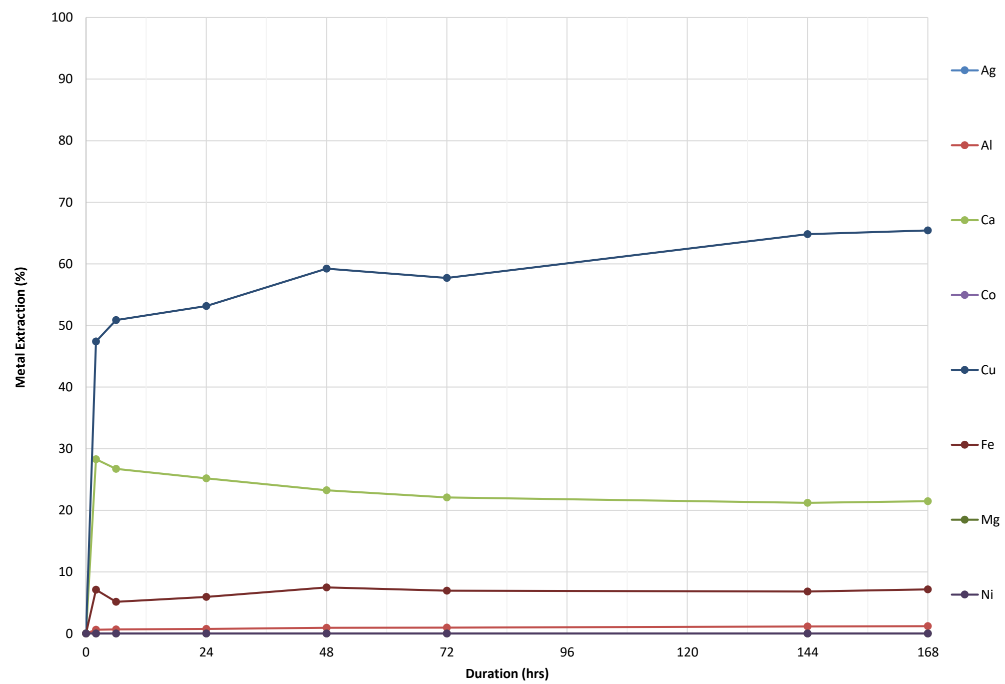
Additional Notes on Termination

Reagent Addition Rates

g H2SO4/kg feed	66	98.0%	purity
g H2SO4 added/g Cu in feed	6.4		
g H2O2/kg feed	17	30.0%	purity
g H2O2 added/g Cu in feed	1.7		
g Ferric/kg feed	40	22.0%	Fe grade in Ferric Sulphate reagent
g Ferric added/g Cu in feed	3.8		

Probe Calibrations

pH calibration buffers	7.0 and 4.0	
pH manual check	1.64	(vs pH 1.68 buffer)
ORP manual check	472	(vs 476mV at amb.)



Residue Assays

Sample ID	Ag g/t	Al %	Ca %	Co ppm	Cu %	Fe %	Mg %	Ni ppm	Si %
KML2895…	18.0	7.73	1.18	20.0	1.04	4.20	1.61	50.0	28.9
Ferric Sulph.	0	0.001	0.003	42.8	0.0001	22.00	0.74	42.8	0.001
Final	18.0	7.50	0.60	20.0	0.39	4.25	1.56	30.0	29.6

% Extraction (Interim Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2		0.60	28.29	<0.1	47.41	7.11	<0.1	<0.1	
6		0.65	26.73	<0.1	50.87	5.13	<0.1	<0.1	
24		0.74	25.19	<0.1	53.17	5.93	<0.1	<0.1	
48		0.93	23.25	<0.1	59.22	7.48	<0.1	<0.1	
72		0.95	22.08	<0.1	57.71	6.94	<0.1	<0.1	
144		1.13	21.21	<0.1	64.81	6.82	<0.1	<0.1	
168		1.18	21.47	<0.1	65.43	7.14	<0.1	<0.1	

% Extraction (Final Gain in Liquor vs Calculated Head)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash		1.14	47.02	<0.1	61.38	5.93	<0.1	<0.1	

% Extraction (Final Residue vs Feed)

Stage / Duration (min)	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final+Wash	3.08	5.97	50.51	3.08	63.97	2.05	6.39	41.85	0.90

Accountability

Basis	Ag %	Al %	Ca %	Co %	Cu %	Fe %	Mg %	Ni %	Si %
Final vs Feed	102	95	93	81	93	102	91	62	99
	g/t	%	%	ppm	%	%	%	ppm	%
Calc'd Head	18	7.35	1.10	15	0.97	4.37	1.46	28	28.6
Assay Head	18	7.73	1.18	20	1.04	4.20	1.61	50	28.9