

Heap Leach Potential Takes Shape

Met Test Work Raises Prospects of Processing ~90mt of Oxide Material

Xanadu Mines (XAM) has completed metallurgical test (met test) work on oxide material (currently classified as waste) from the upper 30m of mineralisation at the Kharmagtai copper-gold project.

This test work has delivered solid results, with recoveries of up to 91% gold and 46% copper, raising the prospects of a potentially economic process route for ~90mt of oxide material. Oxide material is currently excluded from the scoping study due to low recovery rates through the standard flotation circuit that will be used for treating sulphide material.

Further Upside from Process Optimisation

XAM will conduct further studies to confirm and optimise these initial met test results. By refining leach time, decreasing grind size, optimising reagent usage, better understanding leaching kinetics across mineralised zones of oxide material and quantifying the distribution of copper, XAM thinks that further upside to the initial metallurgical test results is likely. This work will be completed as a subset of the overarching Kharmagtai Pre-Feasibility Study (PFS) met test work over the next 12–18 months.

What if Heap Leach of Oxide Were a Project? – Potential 20% Upside to NPV

As the ~90mt oxide material is currently classified as waste material, the economics supporting oxide mineralisation could be highly complementary to the overall project. While information is limited at present on a potential heap leach operation, we have made some high-level and very preliminary assumptions and calculated an unrisks NPV of US\$172m compared to the post-tax scoping study NPV of US\$630m and our unrisks NPV for Kharmagtai of US\$756m. We estimate that the oxide heap leach potential provides indicative NPV upside of ~20%.

Valuation: Risked NPV of A\$0.08/Share

Our risked net present value (NPV) for XAM is A\$0.08/share, fully diluted. Due to the preliminary nature of the oxide heap leach concept, we do not include it in our base-case valuation. The company is advancing as a potentially globally significant producer of copper and gold, and the senior leadership team has significant mining industry experience. The underlying commodity exposure provides a highly favourable outlook in our view, given strong copper prices complemented by significant gold by-product credits. We believe the company can advance over the next 12 months and provide a path to commercial production, and we see numerous catalysts such as FIRB approval for the Zijin investment and progress on the project PFS. Key risks are FIRB approval for the Zijin transaction, progression of the full Zijin transaction and delays or non-completion of the PFS.

XANADU MINES

Xanadu Mines Limited (ASX:XAM, TSX:XAM) is an exploration and development company operating in Mongolia. It provides investors exposure to globally significant, large-scale copper-gold discoveries and low-cost inventory growth. The company leverages its experience and relationships developed over >10 years in country. XAM maintains a portfolio of projects and remains one of the few juniors on the ASX or TSX which controls a globally significant copper-gold deposit in the flagship Kharmagtai project. XAM currently has 2 projects in the South Gobi Desert – Kharmagtai (76.5%) and Red Mountain (100%).

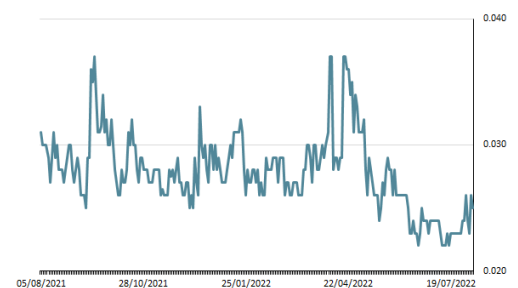
[Click here: Interview with Andy Stewart, VP Exploration](#)

Stock	XAM-ASX
Price	A\$0.027
Market cap	A\$38m
Valuation (per share)	A\$0.08 (unchanged)

Next steps

FIRB and shareholder approval of A\$58m Zijin Mining Group investment (2HCY22)
Commence Pre-Feasibility Study (2HCY22)
Commence Discovery Exploration programs at Kharmagtai & Red Mountain (2HCY22)

XAM share price (A\$) – 1 year



Source: FactSet.

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Exhibit 1 – Company summary – year-end 31 December

MARKET DATA					
Share Price	A\$/sh				0.027
52 week high/low	A\$/sh				0.04 - 0.02
Valuation	A\$/sh				0.08
Market Cap (A\$m)	A\$m				38
Net Cash / (Debt) (A\$m)	A\$m				1
Enterprise Value (A\$m)	A\$m				37
Shares on Issue	m				1,412
Options/Performance shares	m				47
Other Equity	m				1,400
Potential Diluted Shares on Issue	m				2,859

INVESTMENT FUNDAMENTALS						
		Dec-20	Dec-21	Dec-22e	Dec-23e	Dec-24e
Reported NPAT	A\$m	(3)	(9)	(4)	(3)	(4)
Underlying NPAT	A\$m	(3)	(9)	(4)	(3)	(4)
EPS Reported (undiluted)	¢ps	(0.4¢)	(0.8¢)	(0.3¢)	(0.2¢)	(0.3¢)
EPS Underlying (undiluted)	¢ps	(0.4¢)	(0.8¢)	(0.3¢)	(0.2¢)	(0.3¢)
Underlying EPS Growth	%	0.0%	0.0%	-61.4%	-25.2%	24.4%
P/E Reported (undiluted)	x	n/m	n/m	n/m	n/m	(9.9)
P/E Underlying (undiluted)	x	n/m	n/m	n/m	n/m	(9.9)
Operating Cash Flow / Share	A\$	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Price / Operating Cash Flow	x	(9.2)	(9.3)	(16.5)	(17.5)	(16.4)
Free Cash Flow / Share	A\$	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Price / Free Cash Flow	x	(3.9)	(2.4)	(10.1)	(12.3)	(9.9)
Free Cash Flow Yield	%	-25.9%	-41.8%	-9.9%	-8.1%	-10.1%
Book Value / Share	A\$	0.05	0.04	0.04	0.04	0.04
Price / Book	x	0.58	0.63	0.66	0.69	0.72
NTA / Share	A\$	0.05	0.04	0.04	0.04	0.04
Price / NTA	x	0.58	0.63	0.66	0.69	0.72
Year End Shares	m	1,092	1,259	1,542	1,542	1,542
Market Cap (spot)	A\$m	29	34	42	42	42
Net Cash / (Debt)	A\$m	8	3	11	7	3
Enterprise Value	A\$m	22	31	31	34	39
EV / EBITDA	x	(11.4)x	(4.1)x	(8.8)x	(10.0)x	(8.4)x
Net Debt / Enterprise Value		(0.2)	(0.1)	(0.3)	(0.2)	(0.1)

PRODUCTION AND PRICING						
		Dec-20	Dec-21	Dec-22e	Dec-23e	Dec-24e
Payable Copper Sold (kt)	kt	-	-	-	-	-
Payable Gold Sold (koz)	koz	-	-	-	-	-
Copper Price (US\$/lb)	US\$/lb	-	-	4.10	4.20	4.31
Gold Price (US\$/oz)	US\$/t	-	-	1,743	1,786	1,831

12-Month Relative Performance vs S&P/ASX Metals & Mining					

Profit & Loss (A\$m)						
		Dec-20	Dec-21	Dec-22e	Dec-23e	Dec-24e
Sales		-	-	-	-	-
Expenses		(3)	(9)	(4)	(4)	(4)
EBITDA		(3)	(9)	(4)	(4)	(4)
D&A		(0)	(0)	-	-	-
EBIT		(3)	(9)	(4)	(4)	(4)
Net Interest		(0)	(0)	0	0	0
Profit Before Tax		(3)	(9)	(4)	(3)	(4)
Tax		-	-	-	-	-
Underlying NPAT		(3)	(9)	(4)	(3)	(4)
Exceptionals		-	-	-	-	-
Reported Profit		(3)	(9)	(4)	(3)	(4)

Balance Sheet (A\$m)						
		Dec-20	Dec-21	Dec-22e	Dec-23e	Dec-24e
Cash		8	3	11	7	3
Receivables		0	0	0	0	0
Inventory		-	-	-	-	-
PP&E		0	1	2	3	5
Other		44	51	51	51	51
Assets		52	55	63	61	58
Creditors		1	0	0	0	0
Debt		-	-	-	-	-
Leases		0	0	0	0	0
Provisions		-	-	-	-	-
Other		0	0	0	0	0
Liabilities		1	0	0	0	0
Net Assets		51	54	63	61	58

Cashflow (A\$m)						
		Dec-20	Dec-21	Dec-22e	Dec-23e	Dec-24e
Cash From Operations		(3)	(4)	(3)	(3)	(3)
Interest		(0)	(0)	0	0	0
Tax		0	-	-	-	-
Net Cash From Operations		(3)	(4)	(3)	(2)	(3)
Capex		(0)	(0)	-	-	-
Exploration		(5)	(10)	(2)	(1)	(2)
Investments		0	(1)	-	-	-
Free Cash Flow		(8)	(14)	(4)	(3)	(4)
Equity		15	10	11	-	-
Borrowings		(0)	(0)	-	-	-
Dividend		-	-	-	-	-
Net Increase / (Decrease) in Cash		7	(5)	7	(3)	(4)

Source: XAM, MST Access.

Oxide Upside Opportunity at Kharmagtai

Potential Value Accretion from Processing Oxide Ore, Currently Classified as Waste

XAM has identified the potential processing of oxide ore at the Kharmagtai project was identified as one of the key value-accretion opportunities. The ~90mt oxide material is currently classified as waste (given it is unsuitable for processing through a standard sulphide flotation circuit), and this material represents a mining cost (some of which is pre-production capex as pre-strip) as it sits directly on top of the main sulphide orebody.

Potential benefits of processing oxide material

The potential to establish a viable process route for the large tonnages of oxide material provides significant potential benefits for the Kharmagtai project including:

- reduction in pre-production capital expenditure (as oxide material not classified as waste)
- reduced unit production costs and expanded margins
- generation of higher up-front cash flows
- development of a strong heap leach operational capability to economically treat any further discoveries of oxide material as they occur
- increased overall NPV and a strengthened development proposition given the potential reduction in capex and addition of a profitable heap leach operation.

Stage 1 of the Kharmagtai project has estimated capex of US\$694m under the Scoping Study which includes US\$104m related to mining and a one-year pre-strip (see Exhibit 2). Part of this Stage 1 mining cost relates to oxide material vs genuine waste. The oxide material is present across the various deposits and the mine scheduling will be optimised and confirmed as the technical studies advance.

Exhibit 2 – Kharmagtai initial capital costs (Stage 1)

Capital Expenditure	US\$m
Mining	104
Process Plant	289
Tailings	42
Site Infrastructure	32
Indirects	110
Contingency	84
Owners Costs	
Drilling and Excavation	5
Studies	19
General Owners Team	10
Total Initial Capital	694

Source: Company reports.

Preliminary Unrisked NPV Estimation of Processing the Oxide Material

High-level, preliminary assumptions suggest potential NPV of US\$172m for the project

In order to consider the potential NPV impact of the heap leach oxide project, we have made some high-level (and, we emphasise, very preliminary) assumptions. Exhibit 3 shows the core assumptions we used to calculate the NPV.

Exhibit 3 – Oxide heap leach assumptions

Oxide Project Assumptions	MST Estimate
PROJECT ASSUMPTIONS	
Ore Processed annually (million tonnes per annum)	9
Copper Grade	0.2%
Gold Grade g/t	0.2
Mine Life (years)	10
Copper Recovery	46%
Gold Recovery	91%
Mining Cost (US\$ per tonne)	1.87
Processing Cost (US\$ per tonne)	4.50
Copper Produced annually ('000 tonnes)	7.9
Gold Produced annually ('000 oz)	50.0
COST & FINANCING ASSUMPTIONS	
Discount Rate (%)	10.0%
Stage 1 Capex (US\$m, real)	200
AISC (US\$/lb, real) - Copper including by product credits	(0.97)
Post-Tax NPV (US\$m) - base case unrisked	172
PRICING & EXCHANGE RATE ASSUMPTIONS	
Copper Price (US\$/lb)	4.00
Gold Price (US\$/oz)	1,700
Corporate Tax Rate (%) - Mongolia	25.0%

Source: MST estimates.

For these preliminary calculations, we have assumed that the 90mt of oxide will be treated as a standalone project, without taking into consideration savings in pre-strip capex (as the 90mt material is treated as waste) or any other costs for the main Kharmagtai project.

Our NPV estimate implies NPV upside of ~20%

Using the above assumptions, we broadly estimate an unrisked NPV (on a 100% basis) for the heap leach project of US\$172m. This compares to the post-tax scoping study NPV of US\$630m and our unrisked NPV for Kharmagtai of US\$756m. Based on our NPV estimate of \$US172m the oxide heap leach potential provides indicative NPV upside of ~20%.

Potential Value Above our Current Valuation of XAM

Our current valuation of XAM is \$A0.08 per share (see the details below). If we were to add the value of the oxide project to our valuation and risk it at 50% (as we do the core Kharmagtai project) it would add \$A47m to our value of XAM or \$A0.016 per share, meaning a revised valuation of A\$0.096 per share.

Valuation: DCF-Based SOTP for Per-Share Valuation of A\$0.08

We believe XAM shares are currently trading at a substantial discount to fair value based on our assessment of the fundamental value of the flagship Kharmagtai project as well as the broader portfolio optionality which is present in XAM's Mongolian footprint. This portfolio pipeline will be significantly enhanced in their potential commercialisation based on the success of Kharmagtai which will provide cash flow to reinvest in the most prospective projects and acquire others over time.

Our base-case, risked NPV-based valuation for XAM is A\$0.08/share on a fully diluted basis. We value XAM using a sum-of-the-parts methodology, and apply a risk-weighted discounted cash flow (DCF) analysis for Kharmagtai (the company's primary value driver). Exhibit 4 summarises each of the components of our valuation.

Exhibit 4 – Valuation summary

NPV OF PROJECTS	US\$M	Ownership	Risk	A\$M	A\$/share
Kharmagtai Copper-Gold Project	756	38%	50%	207	0.07
Red Mountain Valuation	30	100%	100%	43	0.01
Kharmagtai Exploration	30	100%	100%	43	0.01
Corporate Costs	(40)	100%	100%	(57)	(0.02)
Net Cash (Debt)	2	100%	100%	1	0.00
Total	778			236	0.08
WACC					10.0%
AUDUSD					0.70
Shares on issue (Undiluted)					1,273
Options & Performance Rights					47
Additional Equity Required *					1,539
Shares on issue (Fully Diluted)					2,859

* Includes Zijin placements at A\$0.04 and additional equity raised at A\$0.06 (midpoint Zijin and valuation)

Source: MST Access.

Base-Case Valuation: Risked NPV of A\$0.08/Share, with Kharmagtai the Key Contributor

Kharmagtai copper-gold: The most material component of our overall XAM valuation is the Kharmagtai project. Kharmagtai is XAM's most advanced project and has been subjected to a Scoping Study which has outlined a range of key assumptions required to establish a reliable production schedule and financial projections.

Based on the existing Mineral Resource and using the production profile defined under the Scoping Study, the project is expected to have a very long mine life of 30 years. Given the scale of the existing Mineral Resource, further exploration upside is likely to provide the greatest opportunity to delineate higher-grade components which can increase metal production rates and reduce unit costs for the same mill throughput and provide increased upfront cashflows to further improve the economics of the project.

While the Kharmagtai de-risking phase remains underway, with the Pre-Feasibility Study (PFS) to be completed over the next 18 months, we account for this by applying a significant risk discount to our derived unrisked DCF valuation for the Kharmagtai Project. We have applied a 50% risk weighting to the project given its stage of development, pending a financing solution and final investment decision.

We have not incorporated our valuation of the heap leach project into our core XAM valuation due to the preliminary nature of the project.

Red Mountain: The Red Mountain project is at an early stage but has significant exploration potential. We have estimated a value of A\$30m for this asset.

Kharmagtai exploration: We have estimated a nominal value of A\$30m for the exploration potential of Kharmagtai. As XAM develops exploration programs for these assets, we will reassess our valuation.

Key Assumptions

Our base-case NPV valuation is built upon a mine plan which broadly aligns with the recently published Scoping Study. The key headline assumptions in our valuation are:

- construction to take place across 2026 and 2027
- mining to commence in 2027 (pre-strip) and process plant throughput and first concentrate production in 2028
- 15mtpa throughput capacity until 2034, expanding to 30mtpa thereafter
- US\$690m Stage 1 capex, US\$620m Stage 2 capex
- operation life to 2056 (29 years)
- ~50ktpa average copper production (life-of-mine)
- ~105kozpa average gold production (life-of-mine)
- AISC of ~US\$1.80/lb (life-of-mine).

We have used a 10% discount rate, 0.70 AUD/USD, copper price of US\$4.00/lb¹ and a gold price of US\$1,700/oz.

We assume the initial project capital expenditure will be funded largely via debt with a 70% weighting allocated to the upfront capital expenditure budget of US\$690m on the assumption that the strategic partnership with Zijin provides access to significant project finance to fund the construction. We assume that the remaining equity contribution for the Stage 1 capex is funded by an equity raising at A\$0.06/share for XAM's equity share (38%).

Our valuation does not incorporate the benefit of any potential additional exploration upside which may increase the grade, production and lower unit costs.

Exhibit 5 – Key assumptions underpinning our base-case valuation vs Scoping Study assumptions

Assumptions	Scoping Study	MST
PROJECT ASSUMPTIONS		
Project Ownership (%)	77%	38%
Strip Ratio (waste : ore)	1.1	1.2
Processing Plant Throughput (Stage 1)	15,000	15,000
Processing Plant Throughput - Expanded (ktpa)	30,000	30,000
Stage 1 Capex (US\$m, real)	690	690
Stage 2 Capex (US\$m, real)	620	620
Mine Life (years)	30	29
Copper Produced (mt life-of-mine), in con	1.5	1.5
Gold Produced (moz life-of-mine), in con	3.3	3.3
Average Annual Copper Sold (kt, life-of-mine)	50	51
Mineral Resource (mt)	1,151	1,151
COST & FINANCING ASSUMPTIONS		
Discount Rate (%)	8.0%	10.0%
Inflation Rate (%)	0.0%	2.5%
Capital Cost, Stages 1 & 2 (US\$m, real)	1,310	1,310
AISC (US\$/lb, real) - First 5 Years	1.02	0.99
AISC (US\$/lb, real) - Post Expansion	1.99	2.01
Post-Tax NPV (US\$m) - base case	630	756
PRICING & EXCHANGE RATE ASSUMPTIONS		
Copper Price (US\$/lb)	4.00	4.00
Gold Price (US\$/oz)	1,700	1,700
Royalty Rate (%)	5.0%	5.0%
Corporate Tax Rate (%) - Mongolia	25.0%	25.0%

Source: MST Access, XAM.

¹ Consensus Forecasts per Factset US\$ per pound: CY2023 3.89; CY2024 4.32; CY2025 4.65; CY2026 4.57

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