

# POSITIVE SCOPING STUDY ON NSW HEAVY MINERAL SANDS DEPOSIT INDICATES ROBUST ECONOMICS

The Directors of Broken Hill Prospecting Limited ('BPL') are pleased to announce positive results from a recently completed Scoping Study\* on production of Heavy Mineral Sand (HMS) concentrates at the Copi North HMS deposit.

## **Study Outcome Highlights**

- ★ Mining: Shallow (6-25m cover), free-digging, unconsolidated sand
- **★** Base Case: waste:ore strip ratio 3.6:1, mining an average grade of 9% HMS
- ★ 1.4Mtpa throughput with an initial 5 year mine life with capacity to extend several years
- ★ Flowsheet: Unique modular mobile plant design utilising the latest industry proven gravity spirals and magnetic separation equipment
- ★ Production: 100,000tpa heavy mineral concentrate split into two product streams: *Magnetic* (ilmenite) and *Non-Magnetic* (zircon-rutile-leucoxene)
- **★** Capital Payback: 30 months
- **★** Capex (+/-35%) excluding contingency: AUD21.8m
- ★ Net 46 month life of mine operating cash flow after costs: AUD45.2m derived from AUD163.6m of total revenue
- ★ Feasibility Studies to commence after completion of drilling aimed at increasing resources beyond current resource boundaries to provide an 8-10 year mine life
- **★ Sensitivity Analyses:**

"Each year of additional potential production adds approximately AUD12M to the undiscounted net cash flow (EBITDA)"

BPL's Chairman Creagh O'Connor AM commented;

"The study shows a robust positive cash-flow during what appears to be the lowest mineral prices we have seen for some time. These very pleasing results bolster our plans to develop a very profitable business. The compact and modular processing plant can be relocated, as and when required, to any number of our 20 other HMS deposits as well as extensions to the Copi North resource which our exploration team is currently exploring.

Our vision is to capitalise on high-grade HMS deposits which have historically been regarded as too small for traditional stand-alone development. However with new advances in technology we believe that production from these shallow sand deposits has significant potential to provide a very healthy return for the Company and its investors as we progress from explorer to developer of heavy minerals in the NSW Murray basin."

Independent specialist mineral sand mining engineers Mineral Technologies (Downer) undertook the study.

<sup>\*</sup> The Scoping Study referred to in this report is based on low-level technical and economic assessments, and is insufficient to support estimation of Ore Reserves or to provide assurance of an economic development case at this stage, or to provide certainty that the conclusions of the Scoping Study will be realised.



BPL's subsidiary Broken Hill Minerals Pty Ltd (BHM) and JV partner Relentless Resources Limited (RRL) are 60% and 40% owners of the project. RRL is earning up to 50% by funding Scoping and Feasibility studies. BHM is the manager of the JV and also has 100% ownership of three other HMS Exploration Licences in western NSW (Figure 1). Previous exploration has located at least 20 separate heavy mineral deposits within these tenements.

## **Media Summary**

Broken Hill Prospecting Limited (BPL) is highly optimistic about the future commercialisation and mine development of its Copi North Heavy Mineral Sands (HMS) project in western NSW after the completion of a scoping study indicating the project has potential to generate strong cash returns even at current low metal prices. The NSW Murray basin is one of the World's major sources of heavy mineral minerals, zircon, rutile, leucoxene and ilmenite.

The independent study has revealed that a mine could potentially yield AUD45.2 million in net operating cash flow after costs from total revenues of AUD163.6 million from the sale of ilmenite, rutile, zircon, leucoxene and ilmenite concentrates over five years and with possibility to extend production over an 8-10 year period as new resources are defined.

The study also indicated that every additional year of operation could add around AUD12 million to the project's undiscounted cash flow (EBITDA).

BPL is planning to undertake extra drilling at Copi North next month and this is aimed at expanding the resource base and extend mine life before commencing a pre-feasibility study.

The Copi North project could have low operating costs thanks to a low strip ratio and the use of innovative mining techniques to reduce costs. Capital to develop the operation has been estimated between \$21-26 million.

The Company's plans are to develop a profitable business utilising innovative compact and modular, mobile processing plant, capable of being relocated to any one of a number of high-grade HMS deposits which the Company is currently investigating beyond Copi North.

BPL's goal is to capitalise on modest but high-grade HMS deposits that have previously been regarded as too small for stand-alone development and overlooked by previous miners.

## **Background to Scoping Study**

## **Mineral Technologies Engagement**

In November 2015 industry leading mineral sands mining engineering firm Mineral Technologies (a member of the Downer group) was contracted to undertake a Scoping Study (the Study) for the potential economic viability of a recently defined (2015) high-grade mineral resource which forms part of the Copi North HMS deposit, located 70km north west of Wentworth in western NSW (Figure 1). The independent study, coordinated with support from specialist mining consultant, Australian Mine Design and Development (AMDAD), was completed as a single, all inclusive report.



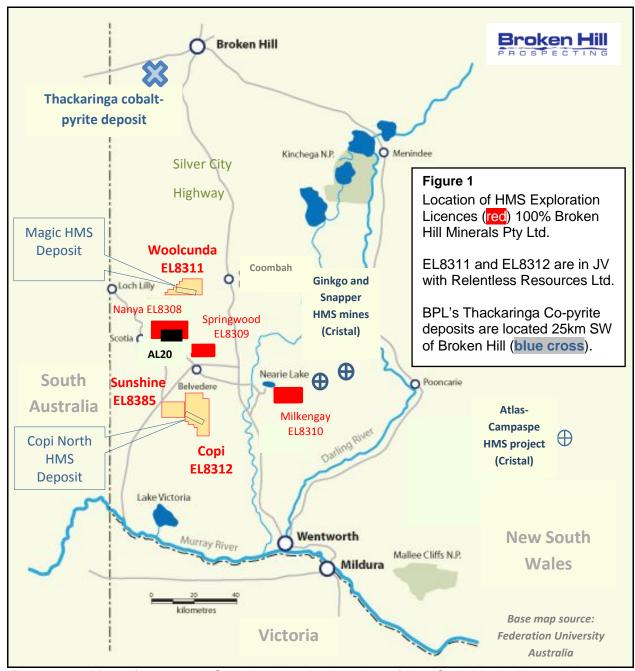


Figure 1. Map of western NSW showing the location of the Copi North Heavy Mineral Sands Deposit and other Exploration Leases and deposits held by Broken Hill Minerals Pty Ltd.

#### Study Conducted within the JORC 2012 Framework

The Study used the JORC code as a guideline, with appropriate assessments of realistically assumed *Modifying Factors*, together with other relevant operational factors that demonstrate, at this time, that progress to a Pre-Feasibility Study for the Copi North Mineral Sands project can be reasonably justified. The factors were set out within the report using the data currently available. In some instances this information was limited or absent and as a result, assumptions, based on similar nearby HMS projects were used.



## Base Case: Whittle Pit Optimisation utilised only part of the 2015 JORC Resource Estimate

The Study used the latest Copi North JORC Indicated & Inferred Mineral Resources (Tables 1 and 2) to identify a "base case" ore mining inventory of 5.0 Mt with a HM grade of 8.43% with a stripping waste:ore ratio of 3.6:1. The ore inventory, based on mining blocks generated by Whittle optimisation software, was used as the basis of a production schedule mining at a feed throughput rate of 1.4 Mtpa for 46 months to produce two streams of HM concentrate, a magnetic (ilmenite) concentrate and a non-magnetic concentrate of zircon, rutile and leucoxene.

The mineralised portion of the strandline used in the Whittle model has a maximum width of 220m and varies in thickness from 1m to 10m. Overburden varies from 6m to 47m, averaging 22m throughout the resource area.

#### **High-Level Flowsheet Based on Sound Metallurgical Work**

As part of the study, Mineral Technologies undertook an analysis of the available metallurgical testwork and characterisation data conducted by ALS Laboratories (Perth) and Diamantina Laboratories (Perth) and has proposed a high level flowsheet design. No specific equipment performance data was available and consequently typical mineral sands performances were used for mass balancing purposes. The flowsheet is based on a plant feed throughput of 1.4 Mtpa at an average heavy mineral grade of 9%. The process utilises industry proven gravity and magnetic separation techniques that are intended to be constructed in a modular design. The processing plants produce a heavy mineral concentrate, which is then upgraded and separated into a magnetic product containing magnetite and ilmenite, and a non-magnetic product of zircon/rutile/leucoxene. At the design feed conditions, and using typical recovery data, it was estimated that approximately 9 t/h of magnetics and 6 t/h of non-magnetic product will be produced. These throughputs have been used in the project economic analysis.

## Site Design Based on Consultant Engineers Experience from Other Projects

Site design included assessment of site access roads, power supply, labour accommodation requirements, workshops and storage etc. The design requirements have been developed from Mineral Technologies' experience at similar operating sites.

#### Sensitivity Analyses: Substantial Upside from Several Identified Areas

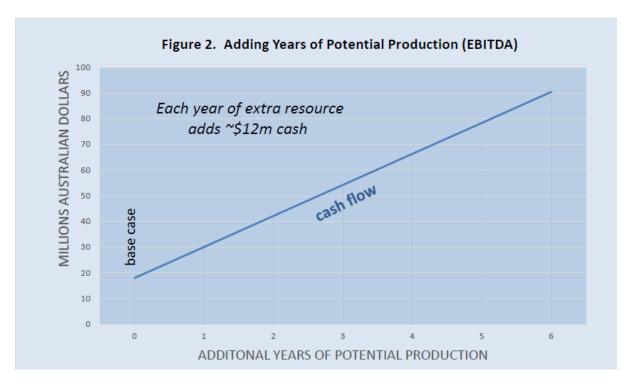
The Scoping Study investigated the possible effect of an additional 6 years production at the rate of 1.4Mtpa ore feed with the same grade. This provided a Sensitivity Analyses on impacts extending the mine life could have on the Project's economics by incrementally adding years of to the mine life.

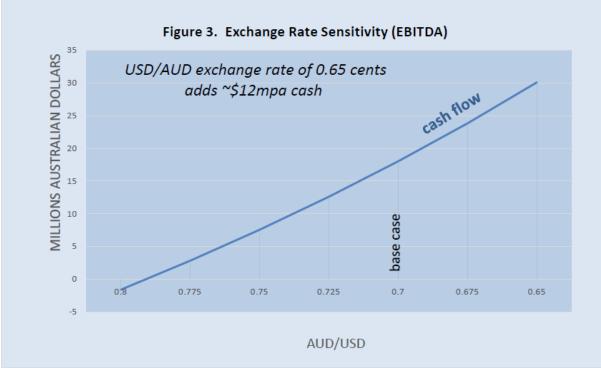
The results showed that for any additional year of mining approximately AUD12 million could be added to annual cash flow (Figure 2). The sensitivity analyses demonstrated that with a modest (10%) increase in HM prices ~AUD15.7 million can be added to cash flow. On an exchange rate scenario, a USD/AUD exchange rate of 0.65 changes cash flow approximately AUD12 million per year (Figure 3).

#### Significant Upside for HMS Extensions Along Trend

The current defined portion of the Copi North strandline deposit extends for approximately 12 kilometres and has a JORC 2012 Indicated-Inferred resource totaling 11.6 million tonnes grading 6.9% THM (Table 1). The deposit is not fully explored with resource remaining open to the SE and NW. It may extend beyond the portion which has been drill tested. In March strike extensional drilling at Copi North is planned and any success in this exploration could add size to the Copi North deposit and to the operational life of the project.







## **Environmental & Cultural Survey Assessments: No 'Show Stoppers" identified**

As part of reporting requirements cultural heritage and environmental analyses were conducted by independent consultants Landskape in November 2015. No Aboriginal cultural heritage places or items have previously been recorded in the areas proposed for mining and extensional drilling and the present survey did not encounter any additional items or places of Aboriginal cultural heritage significance.

The project area has been reported as being degraded through grazing by domestic stock, feral goats and rabbits. Further, ecological assessment (Envirokey, November 2015) found that air core drilling proposed as part of the extended exploration license is unlikely to have a



significant effect on threatened species, populations, communities or their habitat. Further environmental and cultural studies will be undertaken as part of any Feasibility Study process.

As part of its commitment to minimalising impact on the environment, BHM has recently overseen the commissioning of a site based weather station utilising the latest technical advances in environmental monitoring. The now fully operational station is now continually sending live base line data to one of the Company's contracted environmental consultants for use in future environmental impact assessments. Data being collected and monitored includes wind speed, precipitation, temperature and dust.

## **Scoping Study Key Revenue & Cost Figures**

Total operating costs and revenues over the 46 month operating period are estimated as:

Revenue (AUD using AUD/USD 0.70):						
Zircon (USD1,040/t)	58,320,000					
Rutile (USD800/t)	44,810,000					
Leucoxene (USD300-530/t)	19,900,000					
Ilmenite (USD117/t)	40,580,000					
Total Revenue	163,600,000					
Costs (AUD):						
Mining - overburden	33,650,000					
Mining – HM	9,280,000					
Processing MMU/WCP/CUP	22,950,000					
Processing MSP	16,040,000					
Site fixed costs	8,440,000					
HMC and MSP tails trucking	6,100,000					
Final product rail freight	10,270,000					
Final product port charges	8,030,000					
Royalties	3,680,000					
Total costs	118,390,000					
Net Operating Cash Flow	45,210,000					

The total operating cost per dry metric tonne of final product is AUD369.96 broken down as:

Overburden Mining	108.87
Processing MUP/WCP/CUP	69.73
Process MSP	33.33
Rail freight final products	32.00
HM Ore Mining	28.18
Site fixed costs	25.63
Final products port charges	25.00
HMC truck to Broken Hill	18.00
MSP toll charge	16.67
Royalty	11.54
MSP tails truck to Copi North	1.00
Total (AUD)	369.96

A capital cost estimate has been developed for the combined processing plants using industry accepted engineering estimation methods, to a level of accuracy of ±35%.

Capital cost estimate for the Scoping Study is:

Infrastructure	4.5
Process plant	15.1
Indirect Costs	2.2
Contingency	4.4
Total (AUD millions)	26.2



## **Summary & Future Work**

The compact, modular and transportable nature of the plant described in the Scoping Study may not only be suitable for the shallow and high-grade Copi North mineralisation but could also be relocated to process additional resources extending from Copi North (Sunrise) or from other HMS deposits such as Magic (Figure 1, Table 3), Copi South or at any of the other HMS deposits which occur within the BHM tenements.

Following the positive results from the Copi North HMS Scoping Study which found that future discovery of additional mineralisation could add significant value to the project, BHM have commenced logistical planning of a step-out shallow air-core drilling program to explore for a western extension to the Copi North deposit. This programme is expected to be completed by mid-March 2016 and will test for extensions to the Copi North strandline over a 10 kilometre trend within adjoining EL8385.

Commencement of a Pre-Feasibility Study is likely to follow completion of the drilling in mid March 2016 and will take about 12 weeks to complete.

## **Background**

Exploration Licence 8312 (Copi) and recently granted Exploration Licence 8385 (Sunshine) are located approximately 60km WSW of Cristal Mining's Ginkgo and Snapper Mineral Sands wet dredging operations (Figure 1). In March 2015, confirmatory air core drilling was undertaken at the Copi North deposit (EL8312) and the Magic Deposit in EL8311. This work is summarised in the Company's ASX release dated 16 April, 2015 and data used in subsequent resource estimations announced for Copi North on 27th July 2015 and 10<sup>th</sup> September 2015 for Magic.

Summaries of the current Resource Estimates for Copi North and Magic HMS deposits are provided below (Tables 1, 2 and 3).

Resource Status	Tonnes (millions)	THM (%)	Average Density (g/cm³)	Slimes <53um (%)	Oversize >2mm (%)
Inferred	4.6	6.5	1.82	3.0	1.8
Indicated	7.0	7.1	1.84	2.6	2.0
Total	11.6	6.9	1.83	2.8	1.9

Table 1: Copi North JORC Resource (2.5% Total Heavy Mineral (THM) cut-off)

Tonnes	THM	Ilmenite	Rutile	Zircon	Monazite	Leucoxene	Other HM
(millions)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
11.6	6.9	54.4	10.8	11.3	1.0	10.0	12.6

Table 2: Copi North Resource with Heavy Mineral (HM) assemblage.

Mineral	Material	In Situ HM	нм	Clay	Heavy	/ Mineral ('	HM') Asse	emblage	
Resource	Tonnes	Tonnes	(%)			Ilmenite	Zircon	Rutile	Leucoxene
Category	(Millions)	(Millions)			(%)	(%)	(%)	(%)	
Inferred	15	0.56	3.7	4	62	14	6	10	

Table 3 Magic Mineral Resource, August 2015 (2% cut-off grade)

Both deposits are placer accumulations of heavy mineral sands associated with well-defined ancient beach sand strandlines. BPL drilled 129 holes along the trend of the Copi North



deposit and 88 air core drill holes were completed at the Magic deposit located in EL8311, 50km to the north of Copi North.

Drill results from the Copi North HM deposit are considered to contain exceptional HM grades. The data include numerous drilled intervals between 1-4 metres thick which grade >20% HM and many intervals with more than 10% HM content. The deposit occurs as a 100-220 metre wide linear zone trending 303° (average width 130m).

Both the Copi North and Magic deposits are considered to be at advanced exploration status and have been the subject of significant past exploration activities (including substantial amounts of drill testing) by other HMS explorers and miners. The majority of this work was undertaken by Iluka Resources in the 1990's and early 2000's.

The evaluation is fully financed by the private mining investment group Relentless Resources Limited (RRL) which is providing \$2m of funding through a Joint Venture (announced on 22<sup>nd</sup> & 28<sup>th</sup> January 2015) to earn a 50% interest in the two tenements. Broken Hill Minerals Pty Ltd, a fully owned subsidiary of BPL, is manager of the Joint Venture.

## **Additional Comment**

BPL's Managing Director Dr Ian Pringle commented:

"We are extremely pleased with the outcome of the scoping study which looks at initial HMS production at Copi North. The low CAPEX estimate is very much in line with our expectations and the short payback period is very attractive.

It is important to understand what we are trying to achieve here. Copi North is the most advanced of a number of small to medium scale HMS strandlines identified within our regional portfolio of projects and as such is being treated as 'the first cab off the rank'. We are targeting early production utilising a small mobile plant that can be easily moved to other HMS deposits like our recently drilled Magic resource which is one of about twenty other HMS deposits in BHM's ground.

Our exploration team is confident that there is considerable upside to extend the Copi North HMS deposit towards the west where drilling is planned to commence in the next few days.

Copi North as the first deposit in this pipeline and this study needed to demonstrate a stand-alone economic robustness capable of pay back over a short period. Definition of additional resources will clearly extend the project life and may considerably increase cash flow."

Yours faithfully,

Ian J Pringle (Managing Director)

**Broken Hill Prospecting Limited** 



#### **Competent Person Statement**

Exploration activities and sampling results contained in this notice are based on information compiled by Mr Ian Spence, Managing Director of Broken Hill Minerals Pty Ltd and reviewed by Dr Ian Pringle who is a Member of the Australasian Institute of Mining and Metallurgy. Dr Pringle is the Managing Director of Broken Hill Prospecting Ltd and also a Director of Ian J Pringle & Associates Pty Ltd, a consultancy company in minerals exploration. He has sufficient experience which is relevant to the style of mineralisation and types of deposits under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the December 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code). Dr Pringle has consented to the inclusion in this report of the matters based on his information in the form and context in which it appears.

The information in this report that relates to Mineral Resources for the Copi North HMS Deposit is based on information reviewed by Sue Border, a Competent Person who is a Member of The Australasian Institute of Mining and Metallurgy. Sue Border has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the exploration activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Sue Border consents to the inclusion in the report of the matters based on this information in the form and context in which it appears. Sue Border in not an employee or a related party of the Company or its subsidiaries. Sue Border is a Director/Principal Geologist of Geos Mining.

The information in this report that relates to Mineral Resources for the Magic HMS Deposit is based on information compiled by Mr. Greg Jones who is a Member of The Australasian Institute of Mining and Metallurgy. Mr. Jones is the Principal for GNJ Consulting and was retained by Broken Hill Prospecting Limited to conduct Mineral Resource estimation for the Magic deposit. Mr. Jones has sufficient experience that is relevant to the style of mineralisation and type of deposits under consideration and to the activity which he is undertaking to qualify as Competent Person as defined in the JORC Code 2012. Mr. Jones consents to the inclusion in this ASX release of the matters based on his information in the form and context in which it appears.

#### Cautionary Statement

The Scoping Study referred to in this report is based on low-level technical and economic assessments, and is insufficient to support estimation of Ore Reserves or to provide assurance of an economic development case at this stage, or to provide certainty that the conclusions of the Scoping Study will be realised.

#### About Broken Hill Prospecting Limited ("BPL")

BPL has commenced assessment of Heavy Mineral Sand ("HMS") deposits (titanium and zirconium) located south of Broken Hill in western NSW. These deposits have been extensively explored and drill tested by other parties and provide the Company with an opportunity to progress advanced evaluation and fast-track development of several substantial high-grade heavy mineral sand deposits.

Australia has the world's largest deposits of the titanium minerals ilmenite and rutile. Australian mines extract and refine Ti, but don't process it in large quantities. It is used in many applications in light and heavy industries as well as in jewellery and 3D printing. However approximately 95% is used in an oxide form as the pure white colour crucial in



products from paint to cosmetics. Titanium's strength-to-weight ratio, corrosion resistance and biocompatibility make it perfect for aerospace, medical and sport applications.

## BPL Cobalt and Pyrite (Sulphuric acid) deposits

BPL is progressing with exploration and evaluation of cobalt-pyrite deposits in the Broken Hill area within two exploration tenements (EL6622 and EL8143) and two mining leases (ML86 and ML87).

Broken Hill Prospecting Limited is in a strong strategic position to take advantage of increasing demand for cobalt to meet growth in environmental and industrial uses including rechargeable batteries in automobiles and super alloys. Co-product sulphuric acid could address Australian reliance on imported sulphur and provide opportunities for phosphate fertiliser and mineral processing industries.

#### For further information contact;

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