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RESEARCH

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Broken Hill Prospecting Limited (ASX: BPL)

August 2018

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Note: This report is based on information provided by the company as at August 16, 2018

Investment Profile	
Share Price at August 16, 2018	\$0.07
12 month L/H	A\$0.025 /0.215
12 month target Price	A\$0.23
Issued Capital:	
Ordinary Shares	147.8m
Listed Options	46.7m
Unlisted Options	7.9m
Fully Diluted	202.3m
In Money Options	2.9m
Market Capitalisation - UD	A\$10.35m
Market Capitalisation - Diluted for In-Money Options	A\$10.55m
Cash - June 30, 2018	A\$2.09m
Cash on Option Conversion	A\$0.17m

Board and Management	
Mr Creagh O'Connor AM: Non-Executive Chairman	
Mr Trangie Johnston: Managing Director	
Mr Geoffrey Hill: Non-Executive Director	
Mr Matthew Hill: Non-Executive Director	
Mr Denis Geldard: Non-Executive Director	
Heath Roberts: Business Development	
Ian Morgan: Company Secretary	

Major Shareholders	
Mr Geoffrey Hill	32.82%
Board and Management	34.79%
Top 20	51.31%



Senior Analyst – Mark Gordon

The investment opinion in this report is current as at the date of publication. Investors and advisers should be aware that over time the circumstances of the issuer and/or product may change which may affect our investment opinion.

RETURNING VALUE TO SHAREHOLDERS

Broken Hill Prospecting (ASX: BPL, "BPL" or "the Company") is focussing activities on an eclectic suite of highly prospective exploration and development properties in the Murray Basin of New South Wales, Victoria and South Australia, and the Broken Hill region of New South Wales.

Most relevant to current markets is the involvement in the Thackaringa Cobalt Project ("TCP"), with this in a Joint Venture (Thackaringa Joint Venture, "TJV"), with Cobalt Blue (ASX: COB, "COB"), a special purpose vehicle spun out of BPL in early 2017 for the purpose of advancing and developing the TCP. A Pre-feasibility Study ("PFS") has recently been completed for the Project, with COB fully funding activities under the terms of a Farm-in and Royalty Agreement (the "Agreement") with BPL. Under the terms of the Agreement (Appendix 1) COB can earn 100% of the TCP, with BPL retaining a 2% net smelter return royalty ("NSR") on any cobalt produced - COB has thus far earned 51% with COB's submittal to move to 70% ownership currently being reviewed by the Company.

Also under the terms of the Agreement BPL has retained the right to base and precious metals over the TJV tenements which are located just 25km from Broken Hill; in addition it has over 200km² of other base and precious metals and industrial minerals rights in the area. Historic and more recent work has highlighted the prospectivity of the tenements for all minerals sought, with this work delineating a number of priority prospects that are now to be followed up in a comprehensive exploration programme - these include prospects hosting Broken Hill style mineralisation. There is also significant potential for the discovery of additional cobalt mineralisation within the TCP, with ~40km of prospective stratigraphy remaining untested.

Another key focus are the Murray Basin heavy mineral sands ("HMS") properties, which at 7,300km² make BPL the largest land holder in the basin. The Murray Basin is a proven HMS producer, hosting some of the highest unit value deposits globally, with Iluka and Cristal also being active in the region. The Company has deliberately taken an anticyclical approach, picking up the tenements at a time of low titanium and zircon prices with the majors retreating. This pegging followed a comprehensive data review, with this identifying areas where mineralisation had been previously been found, but considered too small for the majors. The strategy will be to upgrade these to Resources, and then look at a low capital cost staged, sequential development using mobile plant.

KEY POINTS

Highly prospective properties: BPL's holdings are highly prospective for the minerals sought. This has been confirmed by the HMS occurrences identified in the data compilation in the Murray Basin, and the results of previous base and precious metals, and industrial minerals exploration in the Broken Hill tenements.

Returning value: The 2017 spin-out of Cobalt Blue (one of the best performing IPOs at the time) was a canny market move, and returned significant value to shareholders via the in-specie distribution of COB shares - at the peak the COB shares were worth A\$0.40 per BPL share, and are still currently worth A\$0.14 per BPL share. The Company has also realised value through the A\$3.1 million sale of HMS properties as part of the settlement of litigation.

Low cost exploration for significant returns in the Murray Basin: Current activities in the Murray Basin are largely involved in the compilation, review and interpretation of historic exploration data, with these low cost activities identifying quality targets for further work.

Infrastructure rich, recognised mining destinations: The Broken Hill area is historically a major mining area, and is well served with infrastructure; likewise the Murray Basin is a proven HMS producer, with the BPL tenement areas generally being well served by infrastructure.

Strong resources markets: This particularly applies to the HMS markets, with these now recovering after a period of low price. In addition cobalt prices are forecast to remain strong for the foreseeable future largely due to the growing demand for batteries for electric vehicle.

Experienced and committed personnel: The Company's personnel have extensive technical and commercial experience in the resources industry, including in the key target commodities and regions.

Fully funded over the rest of 2018 and steady news flow: The Company has a fully funded active exploration, appraisal and development programme over the rest of 2018 which will result in a steady news flow. This is funded by current cash reserves and the obligations of the JV partner at Thackaringa.

Price target of A\$0.23/share: Our price target is based on the value of the current projects and the risk weighted value of payments due on the development of the TCP. Exploration success on the other projects will result in significant upside to this.

SWOT ANALYSIS

Strengths

- ◆ **Prospective projects in world class regions:** Both the Broken Hill block and Murray Basin are world class mineral provinces for their respective resources - the prospectivity of BPL's holding has been borne out by the results of historic and current exploration.
- ◆ **Creating and returning value:** This is particularly relevant to the COB spin-out, which, at the price high of A\$1.67/share, had created A\$58.5 million of value for BPL shareholders.
- ◆ **Experienced people with skin in the game:** BPL personnel have extensive experience in technical and commercial facets of the resources industry, and in particular have experience pertinent to the Company's projects and strategy.
- ◆ **Mineral sands strategy:** The strategy of looking for the "cast-offs" of major companies in a weak mineral sands market looks like it will return good value, with the results starting to show. It has often be shown that projects that would not meet the size/return hurdle of majors prove to be excellent growth assets for junior companies. In addition, the proposed low capex production strategy should help ease any financing should there be the decision to develop any of the HMS projects.
- ◆ **TJV tie in with LG International:** This could have important ramifications for technology sharing and the financing of the TCP - LG Chem, an affiliated company is a major end user of cobalt in batteries will require security of supply going forward, with the TCP potentially providing this.

Weaknesses

- ◆ **Mineral sands:** This is a market perception issue (and not an issue with the quality of the Company's projects), with mineral sand projects, when in the exploration and resource definition generally only garnering mild interest in the market; it is only when potential investors can see material progress with regards to development (including offtake and financing) that markets will sit up and take notice.
- ◆ **Highly sensitive TCP:** The TCP is highly sensitive to commodity prices, exchange rates and operating costs, which may make it difficult to finance, particularly with the expected ~A\$550 million up front capital. This was reflected in the market's reaction to the release of the PFS, with the share price initially falling by ~37% on the back of the release, however it recovered to trade at ~25% below the pre-release price. Although financially viable at current cobalt prices, and those forecast by CRU, +20% falls in the cobalt price make it a far riskier commercial proposition. That being said, we may see end users looking to security of supply, and not concentrating so much on the economics of a project. It also needs to be said that the majority of proposed cobalt projects are high cost and metals price sensitive.

Opportunities

- ◆ **Discovery and resource definition:** This is the key opportunity in the properties other than the TCP, with the results of historic exploration and the geological setting highlighting the potential for meaningful HMS resources in the Murray Basin and discovery in the Broken Hill tenements.
- ◆ **Additional resources and consolidation in the TCP:** There are significant areas of cobalt mineralisation hosted by other companies in the Broken Hill area, as well as additional discovery potential within the TJV ground. The addition of extra resources through consolidation or discovery will help the economics of any future cobalt operation, through the extension of mine life and/or increasing throughput.
- ◆ **Other projects:** There is the opportunity to pick up additional ground and projects when and if high quality properties become available.

Threats

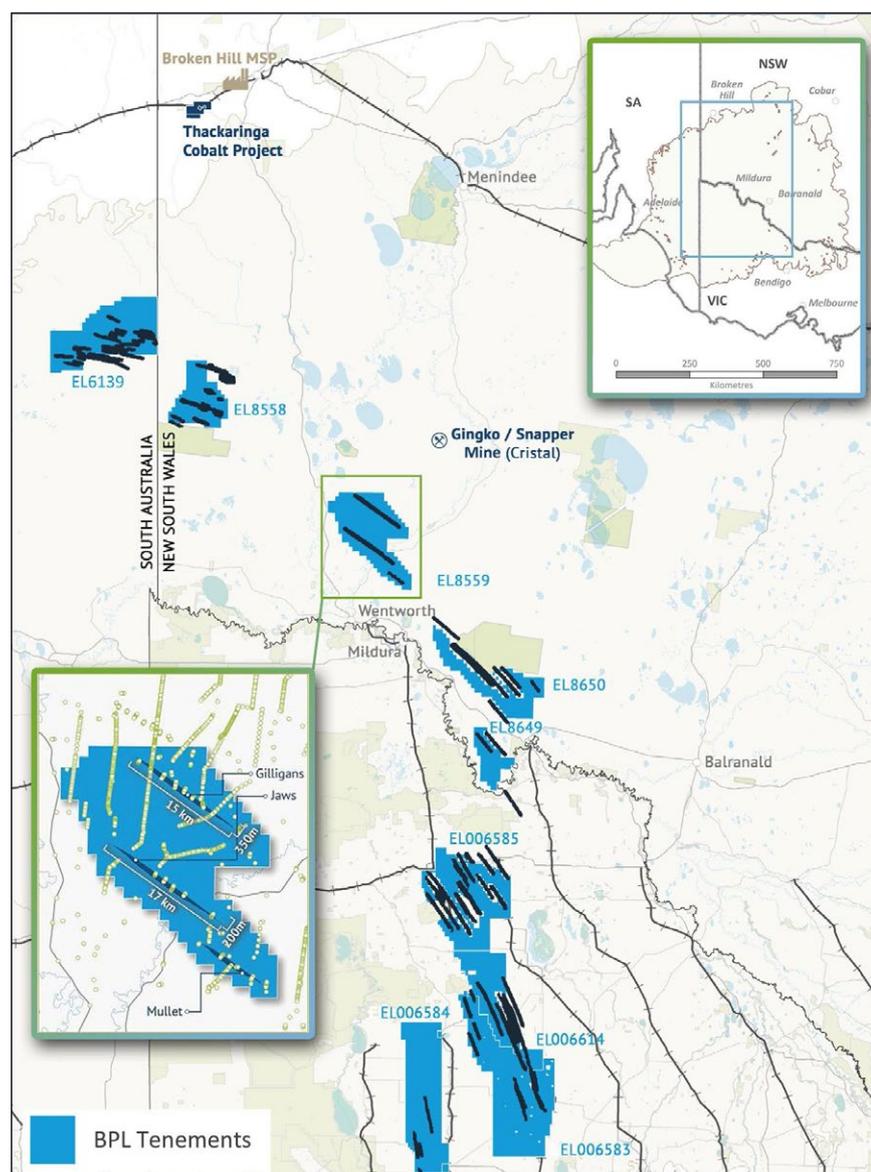
- ◆ **Metallurgy:** This is the key technical threat/risk at the TCP, with further work, including a pilot plant required to prove up the planned processing route (and in particular product recovery), and to demonstrate that products will meet the specifications of end users.
- ◆ **Permitting:** This is a perennial threat for resources projects, however, we see this as not the potential for a failure to permit, but as permitting taking longer than expected.
- ◆ **Financing:** This applies to the TCP, which may be difficult to finance, given the relatively high capex and the generally volatile nature of cobalt prices. Should the project be developed however BPL will be immune from the cost of financing, in that it should have no effect on the royalty.
- ◆ **Lack of exploration success:** This is self-explanatory, and affects all explorers.
- ◆ **Prices and markets in general:** These are constant threats to junior resource companies, and in the case BPL are particularly pertinent with regards to HMS and cobalt.

OVERVIEW

STRATEGY AND PROJECT OVERVIEW

- ◆ BPL is a diversified explorer, with key projects including the following (Figure 1):
 - The Thackaringa Cobalt Project, in which Cobalt Blue is earning 100% (currently at 51%) in the TJV with BPL,
 - Broken Hill exploration - this includes the tenements under the TJV (the JV is for cobalt and related minerals only) and additional 100% held tenements, and,
 - Murray Basin mineral sands.
- ◆ **Readers please note, although the TCP is discussed initially and at length here, successful development of the project will result in BPL retaining only a royalty interest - our view is that there is more current and upside value in the other projects** - the relative value of the TCP to BPL and COB is reflected in the comparative market capitalisation of the two JV partners.
- ◆ Cobalt Blue is a spin-out of BPL, with the A\$10 million February 2017 listing resulting in an in-specie distribution of 35 million Cobalt Blue shares to BPL shareholders, at the time representing a distribution of one Cobalt Blue share for every 4.2 BPL shares held.
- ◆ The Cobalt Blue float, which was a canny move by BPL and took advantage of the positive market sentiment for cobalt, was one of the most successful floats of 2017, reaching a high of A\$1.67/share in April 2018 from a listing price of A\$0.20/share, and thus has returned significant value to shareholders, with the high price equating to A\$0.40 per BPL share; the current price of A\$0.59 represents a value of A\$0.14 per BPL share.

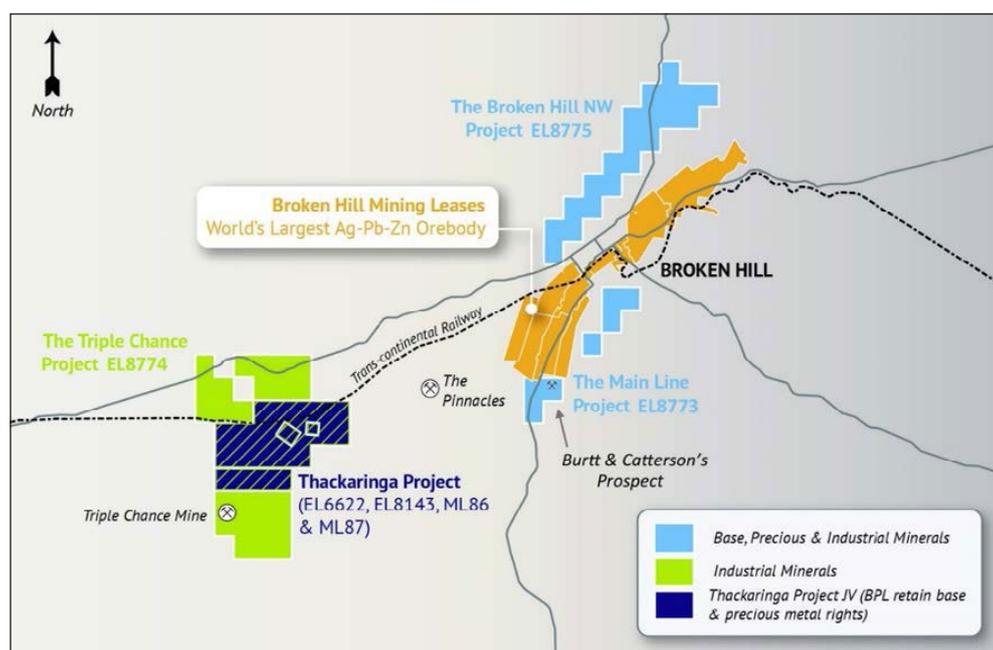
Figure 1: Project location map



Source: BPL

- ◆ Value has also been returned via the A\$3.1 million received from the unlisted Relentless Resources Limited ("RRL") as part of the settlement of litigation between the two parties covering a number of Murray Basin HMS properties - the properties subject to litigation were transferred to RRL.
- ◆ A Scoping Study for the TCP was completed in July 2017, with a positive PFS being recently released - this work is being undertaken by Cobalt Blue, who are operators and managers of the TJV.
- ◆ The TJV is pursuing a "mine to battery" development strategy for the TCP, with the aim to produce high value battery grade cobalt sulphate hepta hydroxide ($\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$), and looking to a potential start to production in 2022, dependent upon financing, permitting and a positive DFS.
- ◆ The Broken Hill exploration is targeting base and precious metals, with the tenements prospective for a number of mineralisation styles, including Broken Hill type ("BHT") lead-zinc-silver and sedimentary hosted copper-cobalt amongst others.
- ◆ In addition the Broken Hill area has been proven to be prospective for industrial minerals, with ELs for these recently being granted (Figure 2).

Figure 2: Broken Hill tenement locations



Source: BPL

- ◆ The Company has taken an anticyclical approach to the HMS strategy, pegging ground near the trough in mineral sands prices, when the major operators have largely been retreating, or at the least, not expanding activities.
- ◆ Key to the business model for the HMS strategy is to look at areas where mineralisation has been found by previous operators (which were largely majors), and to identify deposits that were considered too small for the larger companies, but would make suitable projects for a junior.
- ◆ Plans will be to use conventional wet gravity separation followed by dry electrostatic mineral separation using mobile equipment that will follow the mining face, and will be able to be readily moved between deposits.
- ◆ This is a flexible, low capex strategy that will allow for the sequential treatment of a number of resources.
- ◆ Areas for pegging for HMS exploration were selected following a comprehensive compilation and review of historic exploration data (including that carried out by Iluka) - areas reviewed have had some A\$100 million of exploration expenditure, with work including over two million metres of drilling in +60,000 holes.
- ◆ The Company has reported that previous operators had identified a number of low tonnage, high grade, coarse and low slimes strandline deposits, with BPL now planning to carry out the work, including data validation and geological modelling, required to support the estimation of JORC 2012-compliant Mineral Resources over a number of these, as has already been completed at the 113Mt Jaws and Gilligans deposits.

FINANCIAL POSITION

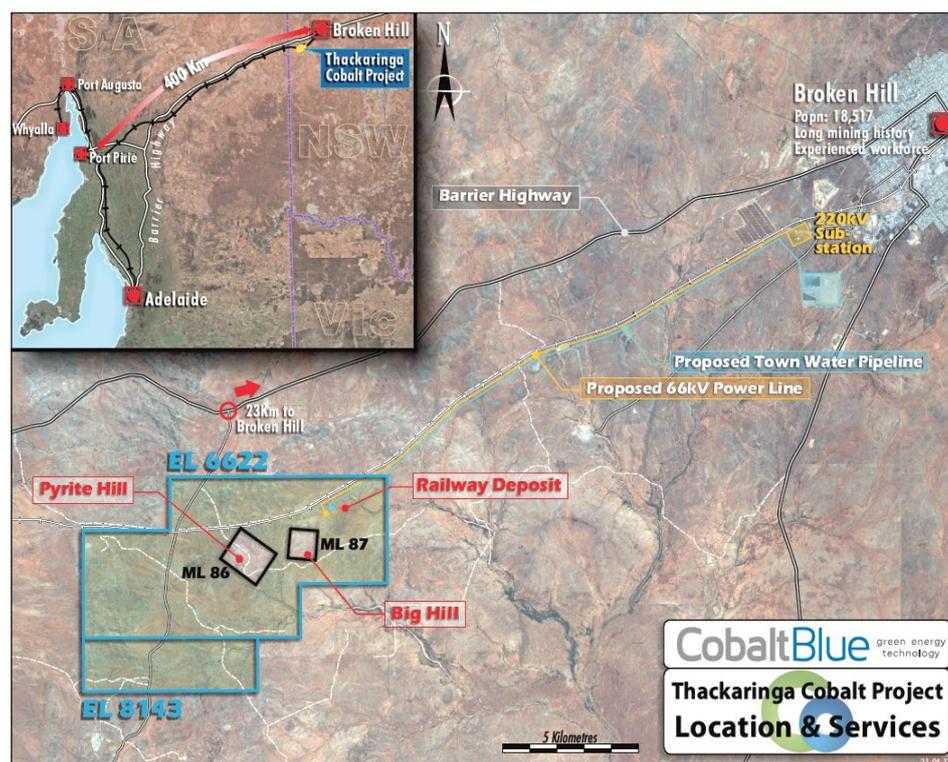
- ◆ As of June 30, 2018, the Company had A\$2.09 million in cash and no debt.
- ◆ 2.9 million options are currently in the money, with the potential to bring in A\$0.17 million on exercise; in addition there are 49.6 million A\$0.08 options, that will be in the money with a 10% rise in the share price, with the potential to bring in A\$3.97 million.
- ◆ Over the twelve months to June 30, 2018 the Company spent A\$.197 million on exploration and A\$1.319 million on administration and staff costs - during the same period JV partner Cobalt Blue spent A\$4.855 million on the Thackaringa Cobalt Project.
- ◆ Over the twelve month period BPL received A\$1.070 million from COB for the reimbursement of exploration activities over the TCP, and received A\$3.1 million for the sale of HMS assets to unlisted Relentless Resources as part of the settlement of litigation in July 2017.

THACKARINGA COBALT PROJECT

LOCATION, TENURE AND JV

- ◆ The TCP is centred some 25km SW of Broken Hill, and 5km south of the Barrier Highway (Figure 3) - given the proximity to Broken Hill infrastructure and skilled mining services are readily available.
- ◆ The Thackaringa JV package includes two granted Exploration Licences ("ELs") and two granted Mining Leases ("MLs") - all tenements are in good standing and cover an area of ~63km².

Figure 3: Thackaringa Cobalt Project location and infrastructure



Source: BPL

COBALT BLUE FARM-IN AND ROYALTY AGREEMENT

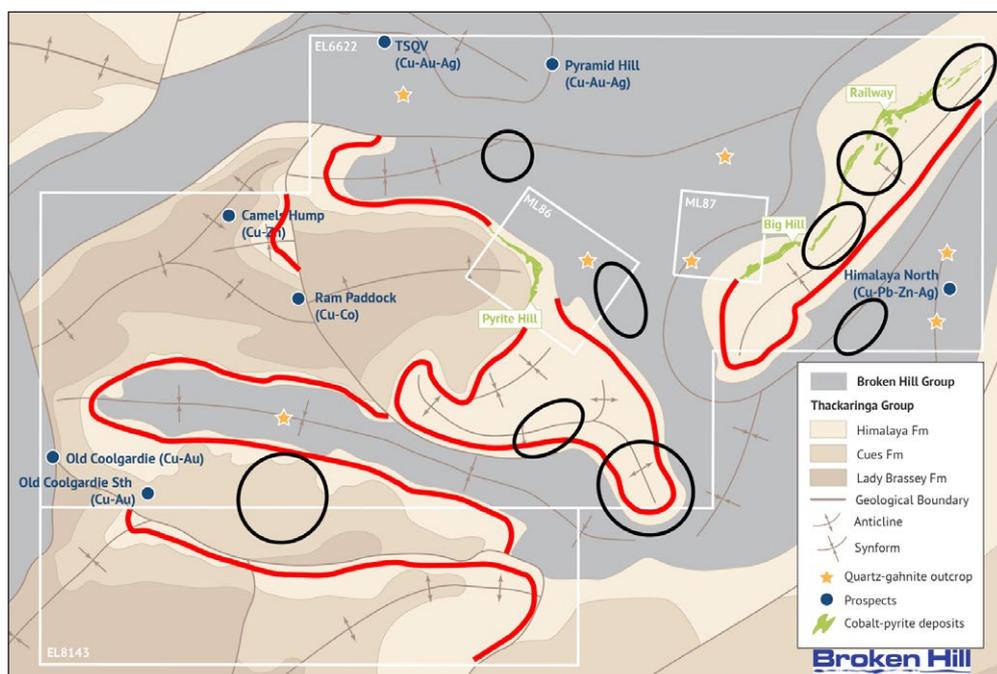
- ◆ The TCP was originally 100% owned by BPL (which acquired the Project in 2000 when still an unlisted entity), however was the basis of the IPO of Cobalt Blue (completed in February 2017), which raised A\$10 million, and of which, at the time of the IPO, an in-specie distribution of shares resulted in BPL shareholders owning 37% of Cobalt Blue.
- ◆ As mentioned earlier 35 million Cobalt Blue shares were distributed to BPL shareholders, with this at a ratio of one Cobalt Blue share for every 4.2 BPL shares held.
- ◆ As part of the spin-out, a Farm-in and Royalty Agreement was signed between BPL and Cobalt Blue, whereby Cobalt Blue could earn up to 100% of the Thackaringa Cobalt Project, which comprises the four tenements as shown in Figure 3.

- ◆ Importantly, this agreement relates to the cobalt and associated mineralisation only; 100% of the rights to base and precious metals remain with BPL and form the basis of exploration activities within the Broken Hill block.
- ◆ The Agreement was subsequently revised following the results of the FY17 work programme - the original and revised agreements are compared in Appendix 1 - to date Cobalt Blue has earned 51% of the Project, however legal title over the tenements still remains 100% with BPL.
- ◆ In summary, to earn 100% of the TCP, Cobalt Blue is required to spend a minimum of A\$10.9 million on the Project and meet a number of performance hurdles by June 30, 2020, with the final hurdles being a decision to mine, including obtaining required project approvals and reaching financial closure.
- ◆ The final stage also includes Cobalt Blue paying BPL A\$7.5 million in cash, with BPL retaining a 2% NSR for all cobalt produced for the life of mine.

REGIONAL GEOLOGY

- ◆ The TCP is located over granulite facies Proterozoic metamorphics (dominated by gneisses, with some retrograde schists) of the Broken Hill Block, part of the Curnamona Craton of western NSW and eastern South Australia.
- ◆ The units are part of the Willyama Supergroup, which includes both sediments and volcanics deposited in a series of rift basins between ~1,730Ma and 1,640Ma. These were subsequently buried to between 12km and 20km depth, and thus are highly deformed and metamorphosed.
- ◆ Units within the TCP include the Lady Brassey Formation, Cues Formation, Himalaya Formation (all within the Thackaringa Group) and the Broken Hill Group; the latter is significant in that it is the host for the giant Broken Hill base metal deposit (Figure 4).
- ◆ It is interpreted that the cobaltiferous pyrite mineralisation within the TCP is hosted by the Himalaya Formation, which is located at the top of the Thackaringa Group in the area.
- ◆ To date only ~5.5km strike length of the host stratigraphy has been tested, with ~40km of untested stratigraphy highlighting the upside potential, with some areas also associated with VTEM anomalies (Figure 4).

Figure 4: Thackaringa Cobalt Project geology, highlighting the 40-km of untested Himalaya Formation that hosts the cobalt mineralisation (red line) and VTEM anomalies (black circles)



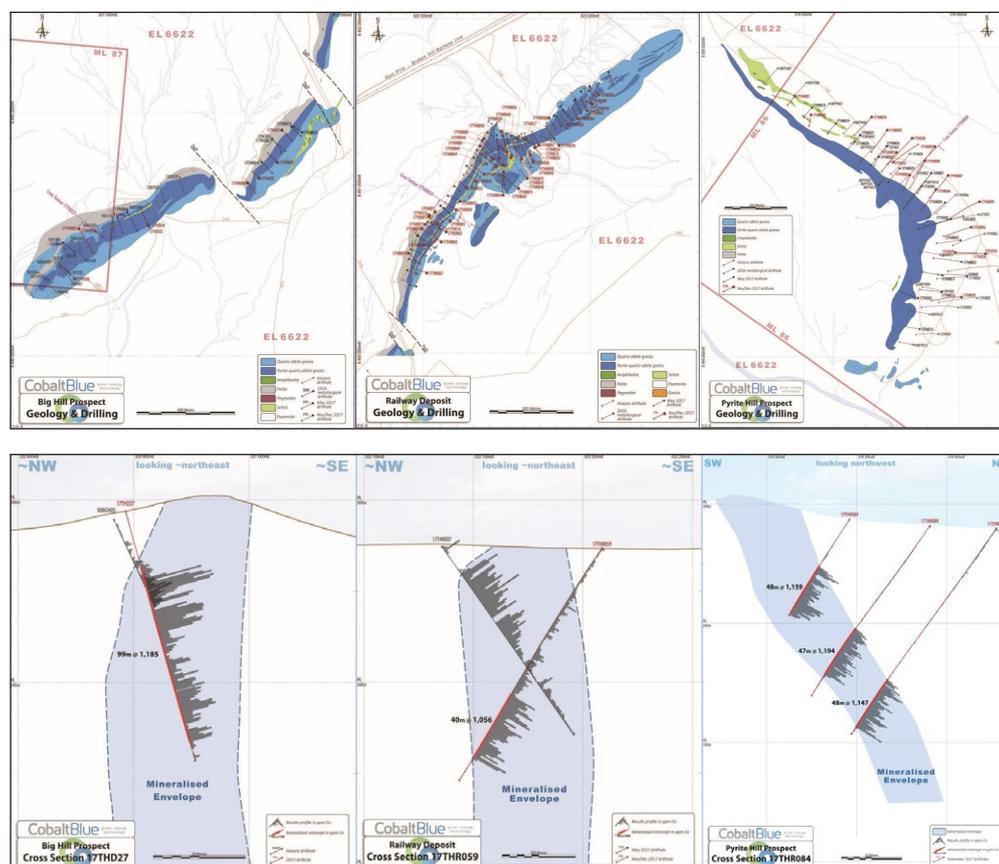
Source: BPL

DEPOSIT GEOLOGY AND MINERALISATION

- ◆ The host rocks for the three recognised cobalt deposits (Pyrite Hill, Big Hill and Railway) are largely composed of quartz-albite-cobaltiferous pyrite-(sericite)-(biotite) gneisses, with the pyrite (both massive and disseminated) occurring in stratabound horizons within the gneiss.

- ◆ Relict primary sedimentary structures, including graded bedding, laminar bedding and slump breccias have been recognised in outcrop, suggesting a largely sedimentary or volcano-sedimentary origin for the precursor rocks.
- ◆ There is an increase in silica associated with cobalt mineralisation, with an almost total lack of micas (sericite and biotite) in the mineralised zones, probably related to alteration and metasomatism.
- ◆ The genesis of the mineralisation is still open to debate, with a number of theories in play, including:
 - Epigenetic metasomatic silica-sodic alteration of a micaceous schist protolith (possibly related to a metamorphic event),
 - Biogenic deposition of the sulphides in an anoxic back-arc basin; and,
 - SEDEX-style mineralisation (which is the preferred option).
- ◆ Given the deformation, the three deposits have different orientations as shown in Figure 5; however all are moderately to steeply dipping.
- ◆ The Pyrite Hill mineralisation is interpreted as occurring in the hinge zone of an antiform, with Big Hill/Railway located predominately along the limb of a synform, albeit with parasitic folds.
- ◆ There is appreciable thickening of mineralisation in fold hinges, particularly at Pyrite Hill, and some attenuation along fold limbs.
- ◆ Dimensions of the deposits are:
 - Railway/Big Hill - strike length of 3,500m overall, depth of 350m (and still open), and a width across strike of between 20m and 300m (averaging 70m); and,
 - Pyrite Hill - forms an arcuate zone with a strike length of 1,000m, down dip extent of 300m (still open), and a width of between 10m and 100m.
- ◆ The morphology of the deposits, particularly the thickness, has resulted in a relatively low strip ratio of 3.70:1 in the PFS.

Figure 5: Thackaringa Cobalt Project deposit plans and sections (refer to Figure 3 for deposit locations) - deposits are (from left to right) Big Hill, Railway, Pyrite Hill



Source: BPL

HISTORIC EXPLORATION ACTIVITIES

- ◆ In addition to activities undertaken on the cobalt deposits, this section also briefly discusses historic base and precious metals exploration.
- ◆ Mineralisation was first discovered in the Project area in 1885, however little work was completed between this time and 1950, with more intensive exploration being undertaken by a number of companies from 1967 until 2000 when BPL acquired the Project.
- ◆ This more intensive work over the cobalt deposits was largely driven by periodic increases in the cobalt price, with 35 diamond and reverse circulation holes being drilled at Big Hill and Pyrite Hill.
- ◆ However during this period exploration for base and precious metals deposits continued, with activities including geological mapping, geochemical sampling, geophysical surveying and reconnaissance drilling, including RAB and shallow RC; a significant amount of this work was concentrated on the Himalaya prospect area.
- ◆ Little work was completed on the cobalt prospects by BPL from 2000 until the Company's listing in 2010, however work, including RAB drilling, outside of these prospects identified the strong mineralised trends at Himalaya North and Pyramid Hill - these results led to the interpretation that these prospects represent strongly deformed, multi-lode stacked Broken Hill style analogues.
- ◆ Following the 2010 listing, initial activities were focussed on Himalaya North and Pyramid Hill, with the drilling confirming the presence and style of mineralisation.
- ◆ Activities then moved to the cobalt deposits, with these being the focus from 2011 until 2014; no field work was then completed until the November 2016 diamond drill programme as discussed below - work in the period from 2011 until 2014 included additional drilling (20 RC and one diamond drillhole), induced polarisation ("IP") geophysical surveying and a resource estimation.
- ◆ This work led to the commencement of a Scoping Study, with this targeted at looking at the economics of sulphuric acid production; the low prevailing cobalt price precluded a standalone cobalt operation.

ACTIVITIES UNDERTAKEN BY THE THACKARINGA JOINT VENTURE

Introduction

- ◆ The TJV has undertaken significant work over the TCP, with key activities including:
 - Drilling of 135 holes for 20,436.4m since H1, FY2017 (with releases to the market on a number of dates; this includes eight diamond holes for metallurgical test work drilled prior to the Cobalt Blue spin-out),
 - Two Mineral Resource upgrades (released to the market on June 5, 2017 and March 19, 2018),
 - A positive Scoping Study (with a notification of completion, but no details due to regulatory requirements) released to the market on July 3, 2017,
 - Geophysical surveying, which included airborne electromagnetics and magnetics (results released to the market in the December 2017 Quarterly Report),
 - Metallurgical test work (released to the market on March 5, 2018),
 - Completion of a PFS as released to the market on July 4, 2018: and,
 - Negotiation of a Strategic Partnership with LG International (announced to the market on March 23, 2018).
- ◆ These milestones are discussed more fully below.

Drilling and Mineral Resources

- ◆ The most recent MRE, as released to the market on March 19, 2018, is presented in Table 1 below - the total Mineral Resource over the three deposits includes 72Mt @ 852ppm Co, 9.3% S and 10% Fe for 61.5kt contained Co (30.15kt currently attributable to BPL).
- ◆ This is a significant update on the June 2017 MRE (54.9Mt @ 910ppm Co, 9.56% S and 10.19% Fe), with 31% more tonnes and 23% increase in contained cobalt, with both MREs being estimated at a 500ppm Co lower cutoff.
- ◆ In addition, the latest MRE has increased confidence, with 72% of the Resource being in the Indicated category, as compared to 11.8% in the 2017 MRE.

- ◆ As of the time of the listing of COB prior to the June 2017 MRE, the global mineral resource estimate for the TCP was 33.1Mt @ 832ppm Co, including (Pyrite Hill, (16.4Mt @ 830ppm Co), Railway (14.9Mt @ 830ppm Co) and Big Hill (1.8Mt @ 870ppm Co).
- ◆ In addition to historic drilling, the latest resource upgrade included the results of three drilling programmes completed by the TJV which totalled 135 holes for 20,436.4m:
 - 2016: 8 diamond drillholes for 1,484.8m, largely drilled for metallurgical samples,
 - 2017: 31 diamond drillholes for 4,299.7m, which included resource expansion, twin and geotechnical drillholes,
 - 2017: 3 diamond drillholes with reverse circulation (“RC”) pre-collars for 574.8m; and,
 - 2017: 93 RC drillholes for 14,177m, predominantly used for resource infill and upgrade.
- ◆ Including historical drilling, as of the completion of the latest drilling by the TJV a database of 204 drillholes for 29,326m has been compiled.

Table 1: Thackaringa Cobalt Project JORC 2012 compliant MRE

Thackaringa Cobalt Project JORC 2012 compliant MRE								
Class	Mt	Co ppm	Fe %	S %	Pyrite %	Co t	Py Mt	Density
Railway (at a 500ppm Co cut-off)								
Indicated	23	854	10.1	9.2	17	19,400	4	2.85
Inferred	14	801	10.4	9.2	17	11,100	2	2.85
Total	37	842	10.2	9.2	17	30,800	6	2.85
Big Hill (at a 500ppm Co cut-off)								
Indicated	7	712	7.2	6.9	13	5,200	1	2.77
Inferred	2	658	6.7	6.3	12	1,500	0	2.76
Total	10	697	7.0	6.7	13	6,700	1	2.77
Pyrite Hill (at a 500ppm Co cut-off)								
Indicated	22	937	10.9	10.2	19	20,300	4	2.87
Inferred	4	920	11.2	10.8	20	4,000	1	2.89
Total	26	934	10.9	10.3	19	24,200	5	2.88
Total (at a 500ppm Co cut-off)								
Indicated	52	869	10.0	9.3	17	44,900	9	2.85
Inferred	20	810	10.1	9.2	17	16,600	4	2.85
Total	72	852	10.0	9.3	17	61,500	13	2.85

Source: BPL

Note: Rounding errors may occur

- ◆ The drilling resulted in a number of broad intercepts, with a selection shown below (as well as in the representative sections in Figure 5):
 - Railway drillhole 16DM05 – 48m @ 1,045ppm Co from 30m,
 - Railway drillhole 16DM06 – 42m @ 1,615ppm Co from 28m
 - Pyrite Hill drillhole 17THD01 – 89m @ 982ppm Co from 34m
 - Pyrite Hill drillhole 17THR016 – 49m @ 1,096ppm Co from 66m.
 - Big Hill drillhole 17THR013 – 54m @ 888ppm Co from 19m drill depth
- ◆ The work has indicated that the mineralisation is relatively homogenous, however the southern half of the Railway deposit is of higher grade than the north and the thickened portion of Pyrite Hill in the fold limb is of relatively higher grade than the limbs; mineralisation at Big Hill is uniform throughout.

Scoping Study

- ◆ A Scoping Study was completed in mid-2017, however due to regulatory requirements detailed inputs and parameters could not be released to the market, however the TJV was of the view that results were encouraging, and warranted progressing to the recently completed PFS.
- ◆ The overall strategy is to develop a “mine to battery” operation, incorporating an integrated mine and refinery, leading to the production of 4,000tpa contained cobalt per year in high purity cobalt sulphate (which contains ~20% Co).

- ◆ The key aspect investigated as part of this study was metallurgy, with a number of options considered with a view to achieving a balance between the recovery of cobalt (and potentially sulphur and iron oxide) and the expected capital and operating costs of any development.
- ◆ The options considered and rankings are presented in Table 2.

Table 2: Thackaringa Scoping Study processing options

Thackaringa Scoping Study processing options			
Concentrate Options	Rank	Products	Cobalt Recoveries
Gravity + Cleaner Float	1	Co-FeS ₂ con	91.70%
Flotation	2	Co-FeS ₂ con	91.49%
Concentrate Processing Options	Rank	Payable Products	
Pyrolysis + Low Pressure (POX)	1	Cobalt, Sulphur, Iron	
Roasting + Leaching	=2	Cobalt, Iron	
Pressure Oxidation (POX) Leaching	=2	Cobalt, Sulphur, Iron	
Roasting + Leaching + Acid Plant	=4	Cobalt	
Atmospheric Leaching	=4	Cobalt	

Source: BPL

- ◆ Following this work, it was considered that the pyrolysis processing option represented the most desirable processing route, given the cost and that it had the potential to generate revenue from all three key concentrate components, namely cobalt, sulphur (either as elemental sulphur or sulphuric acid) and iron oxide.

Pre-feasibility Study

Introduction

- ◆ Cobalt Blue released a PFS for the TCP on July 4, 2018 with this presenting a viable project - the conclusion is to proceed to a DFS.
- ◆ The PFS is predicated on producing cobalt sulphate and elemental sulphur, with the cobalt sulphate to be trucked to Adelaide for export, and sulphur produced for domestic consumption; although not included in the PFS a "concentrate only" strategy is also being considered by the TJV Manager.
- ◆ Two scenarios have been reported (Table 3) - the base case with a 10 year mine life, based on the Reserves of 46.3Mt @ 819ppm Co and 8.83% S and a second scenario using an upside mining inventory of 58.7Mt @ 802ppm Co and 8.7% S, which supports a 13 year mine life.

Table 3: Thackaringa Cobalt Project PFS parameters

Thackaringa Cobalt Project PFS parameters		
Operating Metric - PFS Reserve	Input	Comments
Plant Capex (±25%)	A\$550m	Incl A\$66m in contingency, excl \$25m pre-strip
Plant throughput	5.25Mtpa	Following commissioning period
Cobalt production (metal in sulphate)	3,657 ktpa	Average over first 7 years post ramp-up
Cobalt production (metal in sulphate)	32,453 tonnes	LOM Total
Elemental sulphur production	2.6 million tonnes	LOM Total
C1 Cash Cost (incl sulphur credit)	US\$11.90/lb	Average based on Reserve
Mining Cost	A\$9.41/t ore	Expensed waste SR of 2.72:1, doesn't include capitalised waste of 72.2Mt
Process Cost	A\$25.15/t ore	
Other (includes G & A, royalties)	A\$4.61/t ore	
Initial mine life (Reserve)	9.3 years	Reserve 46.3Mt @ 819ppm cobalt
Operating Metric - Production Target	Input	Comments
Plant Capex (±25%)	A\$550m	Incl A\$66m in contingency, excl \$23m pre-strip
Plant throughput	5.25 Mtpa	Following commissioning period
Cobalt production (metal in sulphate)	3,558 tpa	Average over first 10 years post ramp-up
Cobalt production (metal in sulphate)	40,331 tonnes	LOM Total
Elemental sulphur production	3.3 million tonnes	LOM Total

Thackaringa Cobalt Project PFS parameters		
C1 Cash Cost (incl sulphur credit)	US\$12.80/lb	Average based on Production Target
Mining Cost	A\$10.61/t ore	Expensed waste SR of 3.13:1, doesn't include capitalised waste of 77.9Mt
Process Cost	A\$25.06/t ore	
Other (includes G & A, royalties)	A\$4.60/t ore	
Initial mine life (Production Target)	12.8 years	Mining Inventory 58.7mt @ 802ppm cobalt
Macro Assumptions	Input	Comments
A\$/US\$ Exchange Rate	Fwd curve	2018 \$0.75, 2019 \$0.73, 2020 \$0.71 then \$0.70
Avg LOM Cobalt Sulphate Price	US\$33.80/lb	Independent expert - CRU International
Avg LOM Sulphur Price (landed in Aus)	US\$145/t	Independent expert - CRU International
Financial Outcomes	Outputs	Comments
Pre Tax NPV (8%)	A\$792m	Based on Production Target
Pre Tax IRR (%)	27.00%	Based on Production Target
Post Tax (7.5%)	A\$544m	Based on Production Target
Post Tax IRR (%)	22.00%	Based on Production Target
Project Payback (simple)	4 years	Based on Production Target

Source: BPL

- ◆ Capital cost estimates are presented in Table 4 - we have summarised these from the itemised figures provided in the PFS.

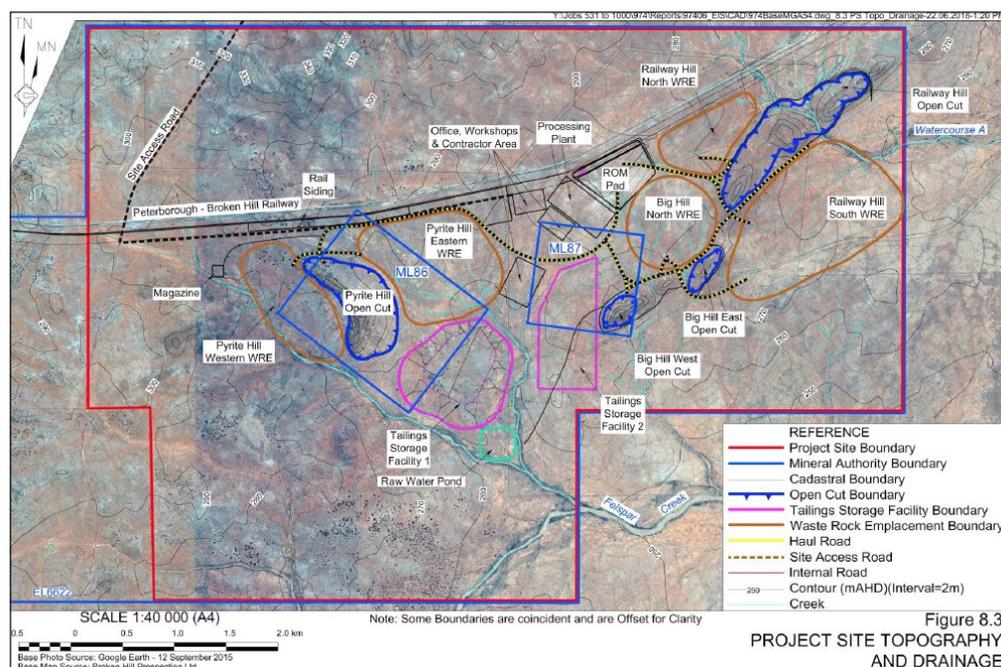
Table 4: TCP PFS LoM capital cost estimates ASM

TCP PFS LoM cash capital cost estimates ASM			
Capital Item	Start-up Capital	Sustaining	LOM
Mine Development/Mining/Startup	19.8	82.9	102.7
Process Plant	384.3	45.9	430.2
Tailings	24.3	33.2	57.5
Infrastructure and services	141.5	-	140.5
Total	569.9	162.0	751.8

Source: BPL

- ◆ The planned site layout is shown in Figure 6.

Figure 6: Thackaringa Cobalt Project conceptual site layout



Source: BPL

- ◆ Costs have largely been estimated from first principals, however given the lack of similar planned operations benchmarking the processing capital and operating costs is difficult.

- ◆ Ni-Co laterite operations may be considered similar in some respects, particularly in the leaching and precipitation stages, however they do not require an oxidation/pyrolysis stage; some other significant differences are given in the points below:
 - The leaching and refining stages at the TCP will treat concentrate only (with a mass pull of ~18% from the ROM); this is in contrast to treatment plants for laterite deposits, which need to be sized to treat all ROM material; and,
 - The high pressure acid leach (“HPAL”) processing used in laterite deposits generally requires higher temperature and pressures (and hence higher costs) than the lower pressure and temperature POx leaching proposed at Thackaringa.
- ◆ Another key point at the TCP is that the mineralised pyrite is coarse, and thus will only require coarse grinding and concentration largely through spirals, resulting in relatively low comminution/concentration operating and capital costs.
- ◆ The Company will be looking at optimising tailings disposal capital and operating costs which they believe are relatively high.
- ◆ The mining costs, although in the ballpark of what we expect could be considered relatively low - the figure of A\$10.61/tonne of ore equates to a figure of A\$2.57 per tonne of material moved at a strip ratio of 3.13:1 for expensed waste to ore - COB has stated however that these are quoted prices, and the relatively low value may reflect the ease of mining broad zones of mineralisation.

Product Pricing and Exchange Rates

- ◆ Both cobalt and sulphur commodity pricing were supplied by CRU; these included an explicit pricing period from 2018 to 2026 for cobalt, with long term pricing used thereafter; CRU’s forecast long term prices are US\$32.90/lb real.
- ◆ The explicit pricing period for sulphur is from 2018 to 2022, with a long term price of US\$145 thereafter; sulphur is priced on the Vancouver FOB price plus freight to east coast Australia.
- ◆ A AUD:USD Exchange rate of 0.70 has been used - this is in the range of what some forecasters are using, however we have used a more conservative 0.75 in our own modelling (discussed later).

Reserves and Mining

- ◆ The PFS includes a maiden Ore Reserve, as presented in Table 5, which includes the Big Hill, Pyrite Hill and Railway deposits.
- ◆ The upside inventory also includes 12.4Mt of Inferred Resources (21% of the total), however this should be readily upgraded through drilling.

Table 5: TCP PFS Ore Reserve and upside inventory

TCP PFS Ore Reserve and upside inventory				
	JORC Classification	Tonnes (Mt)	Co ppm	S%
Ore Reserve	Probable	46.3	819	8.83
Upside inventory	Probable Reserve, Inferred Resources	58.7	802	8.7

Source: BPL

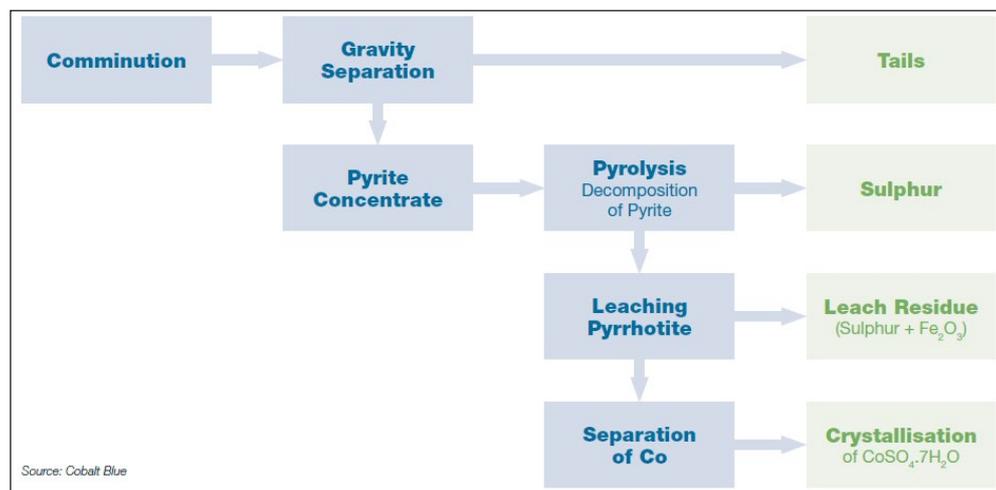
- ◆ Mining, undertaken by contractors, will be by conventional drill and blast methods from the three open cuts (with a LoM strip ratio, including capitalised waste of 3.36:1 for the base case and 3.68:1 for the upside case), with material trucked to a central mill for processing.

Metallurgical Testwork and Processing

- ◆ Metallurgy is critical to the success of Thackaringa, with the most recent work, that was undertaken as part of the PFS, investigating the potential of producing high value downstream products on site, including cobalt sulphate), that can be used directly in the manufacture of lithium ion battery anodes.
- ◆ In an announcement on March 5, 2018, the TJV Manager presented a four stage metallurgical test work programme targeting:
 - Concentration of the sulphide ore,
 - Calcining (heat treatment) of the concentrate,
 - Leaching of the calcine; and,
 - Product recovery, including purification of the leach liquor followed by crystallisation of cobalt sulphate.

- ◆ The ultimate aim is to produce three products:
 - Cobalt sulphate from the leach liquor,
 - Elemental sulphur both from condensation of the calcining off gas and residue from the calcine leaching; and,
 - High purity iron oxide from the leach residue.
- ◆ The PFS includes only the cobalt sulphate and sulphur as end products - Figure 7 presents the processing flow sheet as included in the PFS.

Figure 7: Thackaringa Cobalt Project processing flowsheet.



Source: Cobalt Blue

- ◆ The TJV is looking at using proprietary calcining and leaching processing, and thus full details of the process are not available in the public domain.
- ◆ The PFS test work included the processing of a representative 820kg composite sample of mineralisation collected from drill core:
 - This was crushed to p100 passing 1.2mm, and passed through a gravity spiral circuit to collect a pyrite concentrate,
 - The tails were screened, with the oversize discarded and the fines passed through a froth flotation circuit; and,
 - Both the gravity and flotation concentrates were combined into a single concentrate for further test work.
- ◆ This resulted in the production of 144kg of concentrate (17.6% mass pull), with a 92% recovery of the cobalt to the concentrate and a concentrate grade of 0.52% Co.
- ◆ Further work on this stage included grind size variability, with this indicating that decreasing the grind size to 425µm increased recovery to 94%, however the PFS is predicated on the coarser grid size given the trade off between costs and recovery.
- ◆ Calcining of 90kg of concentrate was completed by ALS Metallurgy in Perth, with the following results:
 - Calcining included roasting/pyrolysis, with work including determining the optimum parameters to be used in the engineering study,
 - The calcining converted over 95% of the pyrite to readily leachable pyrrhotite, and removed ~20kg (~40%) of sulphur into the off gas, with this then condensed into elemental sulphur - further test work is underway to improve the quality of the sulphur (which has ~1.5% SiO₂ as the main contaminant), with this being a potentially marketable product.
- ◆ The leaching test work investigated various methods, including low temperature POx and atmospheric leach; with low temperature POx being the preferred method - autoclave conditions used included a temperature of 130° C and a pressure of 10-15 bar.
- ◆ The recovery of cobalt includes the precipitation of a mixed Co-Ni hydroxide, which is then re-dissolved in a sulphate media, passed over a cationic resin to remove impurity metals and then sent to a solvent extraction circuit to sequentially extract Co and Ni.
- ◆ The test work (which was limited) achieved average cobalt recoveries from the calcine to the final product of 93%, and thus resulting in overall cobalt metallurgical recoveries of 85.6%, within the target range of 85% to 90%; overall sulphur recoveries were 64.4%.

- ◆ The optimum conditions resulted in a cobalt sulphate product containing 20.5% Co, with impurities including ~800ppm Cu and 800ppm manganese.
- ◆ The TJV is aware of the requirement for further recovery test work, and is planning to include a pilot plant in the DFS.

Infrastructure

- ◆ Being located just 25km from Broken Hill, the TCP is well situated with regards to infrastructure.
- ◆ The preferred option for the power supply is to connect into the Broken Hill substation via a 26km, 66kV transmission line - estimated site power requirements are up to 75MW.
- ◆ Water is a key consideration, with Broken Hill suffering water shortages over recent years.
- ◆ Short term solutions have included a desalination plant in Broken Hill and a shallow bore field at Menindee; however work has now commenced on a 270km, A\$467 million water pipeline from Wentworth on the Murray River - current forecasts have this being completed in December 2018.
- ◆ This will have a capacity of up to 37.5ML per day, with the TCP being granted an allocation of 1.5GL per annum - this will require a 26km pipeline to be laid to site from Broken Hill.
- ◆ There is ready road access to site, with the 5km access road from the Barrier Highway to be upgraded.
- ◆ It is planned to construct a siding adjacent to the Broken Hill-Peterborough rail line to handle the sulphur product - the rail line runs alongside the Project.
- ◆ Broken Hill is a ready source for a skilled resident workforce.

Transport and Logistics

- ◆ It is planned to bag, containerise and then truck the cobalt sulphate product to Adelaide for export to end users - transport costs include trucking and shipping costs with products delivered on a CIF basis - the expected cost for packaging, truck and ocean freight is A\$149.50/tonne.
- ◆ Given the potential volumes, sulphur is planned to be railed from site with the target being domestic markets - pricing is expected to be free on train ("FOT").

Royalties

- ◆ Two royalties will be payable by Cobalt Blue upon successful completion and operation of the TCP:
 - A 4% ad valorem (with allowable deductions) royalty payable to the State of New South Wales; and,
 - A 2% NSR royalty payable to BPL.
- ◆ The NSW royalty is calculated from the gross value of minerals sold, less certain deductions, with these in brief including:
 - Onsite treatment expenses,
 - Realisation expenses (marketing, transport),
 - One third of onsite administration expenses; and,
 - Depreciation of the processing plant, tailings dams and components of other site infrastructure attributable to processing and realisation.
- ◆ No deductions are allowable for mining or environmental activities.
- ◆ In calculating the BPL NSR royalty, Cobalt Blue has applied the same deductions plus the NSW state royalty against the cobalt revenue only, however the deductions have been adjusted to reflect the proportion of total revenue that comes from the cobalt.
- ◆ We note that the deductions applied to the BPL royalty include the full processing circuit, and not just parts of the circuit that could be considered smelting and refining, which is generally the norm with a NSR royalty.
- ◆ The effect of this may be that the BPL royalty is understated in the PFS - this will require discussion between the two parties to clarify.

Permitting

- ◆ Preliminary permitting activities are underway, with these including environmental studies, which include acid mine drainage amongst others.

- ◆ The majority of the project is held under pastoral leases and is Crown land, with Native Title extinguished; there however is a small area subject to Native Title over the Big Hill deposit that will require negotiation with the Traditional Owners.

LG International Strategic Partnership

- ◆ As announced on March 23, 2018, the TJV has entered into a Strategic Partnership with LG International ("LGI") - LGI is the resources investment arm of LG Corporation, with the partnership also being in association with LG Chem, one of the largest lithium-ion battery producers globally.
- ◆ The agreement also saw LGI taking a strategic placement of 7.09 million shares in Cobalt Blue, raising A\$6 million.
- ◆ Under the terms of the partnership LGI has the option to provide capital and technical assistance to Cobalt Blue to facilitate the production of high purity cobalt sulphate suitable for battery production.

BROKEN HILL REGION EXPLORATION

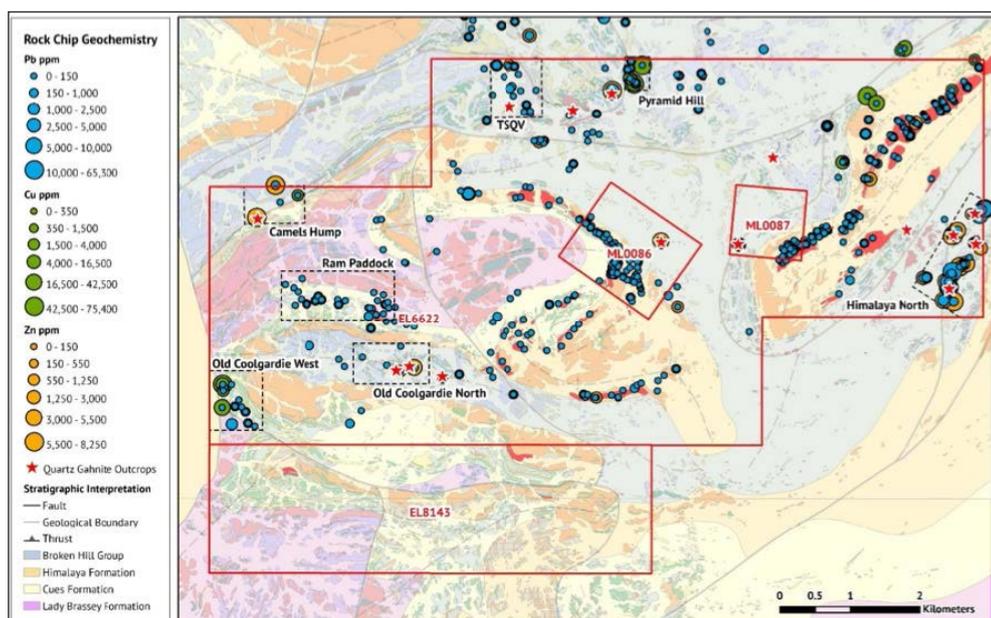
BACKGROUND AND TENURE

- ◆ In addition to the involvement in the TJV, the Company is undertaking a comprehensive exploration programme under its own right in the Broken Hill region.
- ◆ Target minerals include base and precious metals (Group 1), industrial minerals (Group 2) and clay minerals (Group 5) - the current tenement position is shown in Figure 2.
- ◆ These tenement fall into three groups:
 - The current TJV tenements, in which BPL retains 100% of the rights to all copper, lead, zinc, gold and silver,
 - Triple Chance (EL5623, 45 units, 131km²), which has been pegged for industrial and clay minerals (Groups 2 and 5), and which covers the current TJV tenements as well as Group 1 mineral tenements held by other companies; and,
 - Broken Hill NW (EL 5622, 20 units, 58km²) and Main Line (EL 5623, 7 units, 20km²) which have been pegged for Groups 1, 2 and 5.

GEOLOGY, MINERALISATION AND EXPLORATION

- ◆ The regional geology is described previously and shown in Figure 4; Figure 8 below includes the same information as Figure 4 with the addition of the results of historic and more recent rock chip sampling.
- ◆ Figure 9 presents the stratigraphic column, and the interpreted mineralisation styles and stratigraphic relationships of the prospects identified to date - note that this only includes tenements within the TJV, and not the recently granted adjacent tenements.

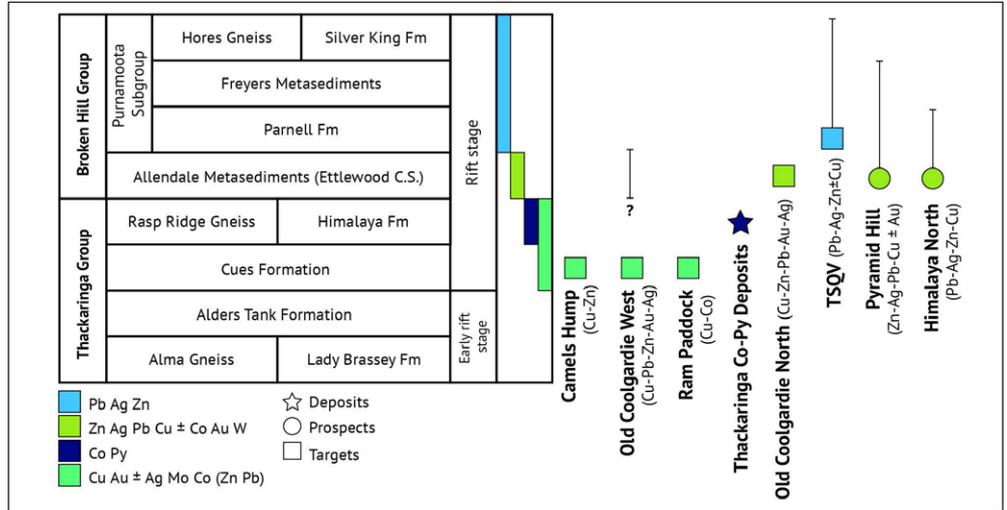
Figure 8: Thackaringa Joint Venture geology and key prospects.



Source: BPL

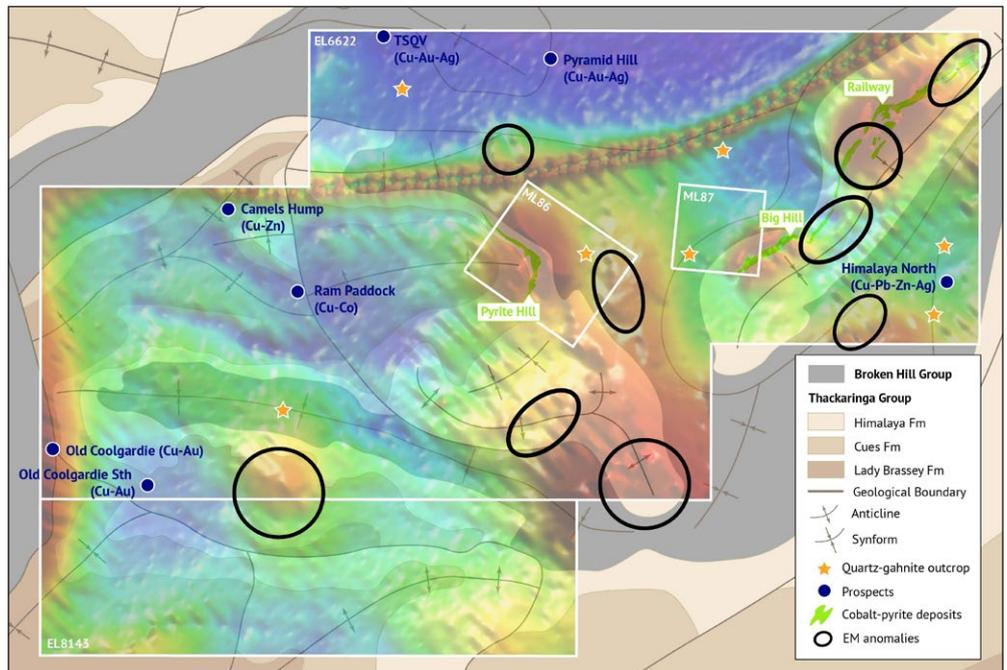
- ◆ As shown in Figures 8 and 9, work to date has identified a number of prospects, with a number selected for further work.
- ◆ Recent work has included a detailed VTEM/magnetics survey over the TJV tenements - this survey, which was funded by COB, has identified a number of additional targets (Figures 4 and 10) to those described below which now require follow up.

Figure 9: Thackaringa Joint Venture tenement mineralisation styles and stratigraphy.



Source: BPL

Figure 10: Thackaringa Joint Venture tenement VTEM survey targets.



Source: BPL

- ◆ Within the Broken Hill Group (which hosts the Broken Hill deposit), key prospects include Pyramid Hill (+500m strike identified) and Himalaya North (+1,500m strike identified), with previous rock chip sampling and shallow reconnaissance drilling returning encouraging results; in addition quartz gahnite occurrences have been identified at Himalaya North.
- ◆ Gahnite is a zinc spinel, and is a diagnostic/vector mineral for Broken Hill type mineralisation and has been identified in a number of other locations within the tenements (Figures 4 and 8).
- ◆ Copper rich mineralisation has been identified within the Cues Formation (Figure 9), with the potential for both copper-rich Broken Hill style mineralisation and sedimentary Cu-Co mineralisation being identified.
- ◆ Other base and precious mineralisation styles that the tenement package is considered prospective for include structure hosted Thackaringa style Pb-Zn-Cu-As-Ag veins and stockworks.

- ◆ The prospectivity for industrial minerals, including flourite, beryl and feldspar is confirmed by the presence of deposits of these minerals in the region - the Triple Chance Project includes the historic Triple Chance Feldspar Mine as well as occurrences of flourite associated with Broken Hill style mineralisation.
- ◆ The Main Line and Broken Hill NW tenements are both considered to be under-explored by the Company, and contain base metal occurrences; Main Line is along strike from Broken Hill (and abuts the consolidated Mining Lease) and contains a number of copper prospects that have only seen limited modern exploration.
- ◆ Copper prospects include the historic Burt & Catterson's Copper-Cobalt prospect which saw three diamond holes drilled in 1957 but no modern follow up despite significant Cu, Zn and Co assay grades; the Company has recently resampled core (which is held at the Geological Survey of NSW's E.C. Andrews core facility in Broken Hill), with assays awaited.

MURRAY BASIN MINERAL SANDS PROJECT

LOCATION AND TENURE

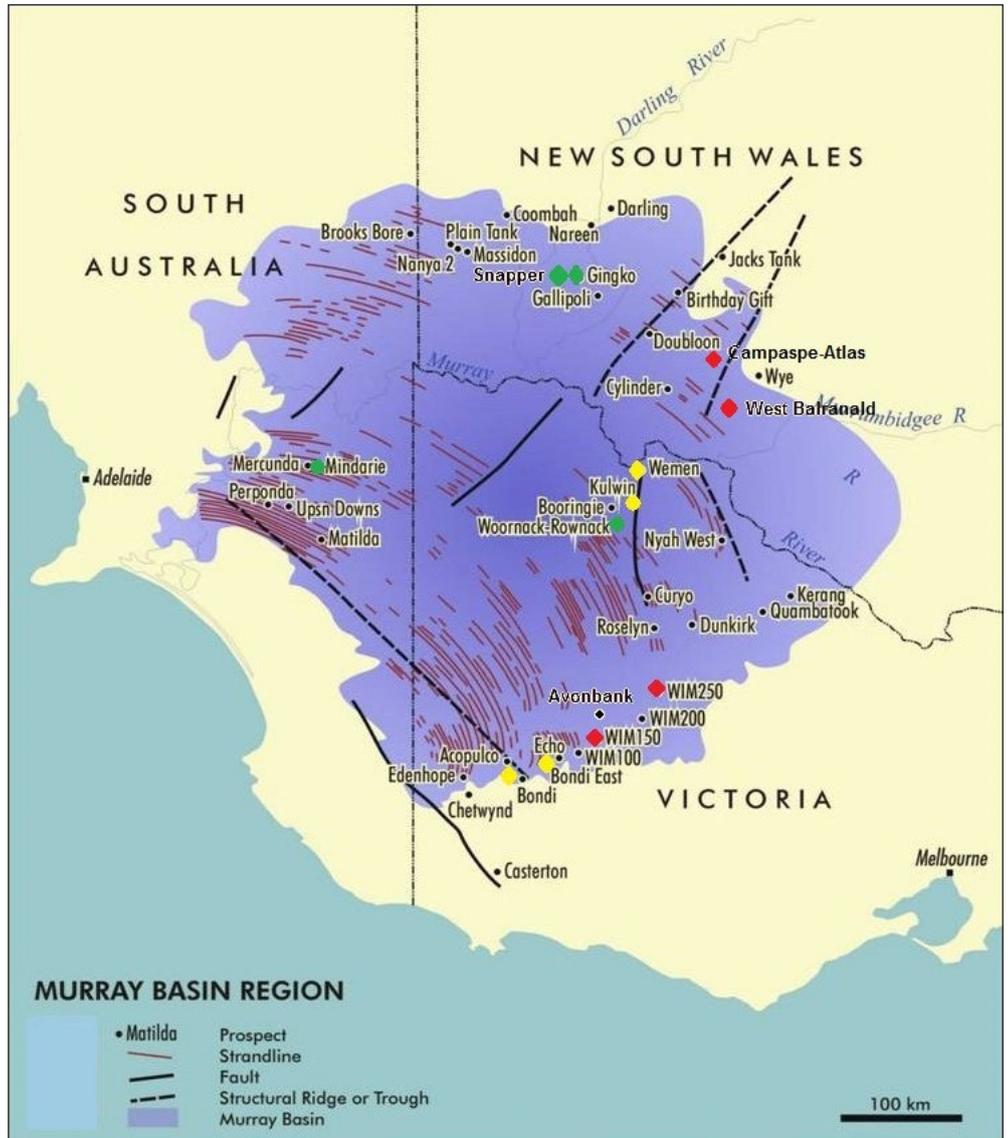
- ◆ The Company holds ~7,300km² in nine tenements that have been shown to be prospective for strandline style mineral sand deposits located over the Murray Basin in South Australia, New South Wales and Victoria (Figure 1).
- ◆ The tenements, which make BPL the largest tenement holder in the Murray Basin, were selected following a comprehensive compilation and review of historic exploration data, including that collected by global major mineral sands producer, Iluka.
- ◆ The Murray Basin has had some A\$100 million of exploration expenditure, with work including over two million metres of drilling in +60,000 holes.
- ◆ The Company has reported that previous operators had identified a number of low tonnage, high grade, coarse and low slimes strandline deposits, with BPL now planning to carry out the work, including data validation and geological modelling, required to lead to the estimation of JORC 2012-compliant Mineral Resources over a number of these, as has already been completed at the 113Mt Jaws and Gilligans deposits.
- ◆ The tenements, which are all in good standing, cover areas that are well served by infrastructure, including transport, and in most areas power.

GEOLOGY AND MINERALISATION

- ◆ The main geological feature is the Murray Basin, which has been formed by a series of three main marine transgressive and regressive cycles since the Eocene Epoch (~50Ma) within the Murravian Gulf (Figure 11).
- ◆ The identified mineral sands deposits are related to the latest marine regression, which occurred during the Pliocene, commencing ~5Ma.
- ◆ The HMS deposits are hosted in the Loxton-Parilla Sands, which take the form of a series of dune barrier complexes formed along an ~400km long coastline at the head of the Murravian Gulf as the sea level dropped - a section through a barrier complex is shown diagrammatically in Figure 12.
- ◆ These host two styles of deposits; large, flat lying sheets of fine shallow marine sands as exemplified by the WIM 150 deposit, and strandlines, which are typically limited in width (10's to 100's of metres, but can have strike lengths of several kilometres (Figure 11).
- ◆ The current deposits would have been formed from the reworking of older sands that were enriched in the heavy minerals.
- ◆ The strandlines are, due to the upgrading by higher energy deposition processes (including storm activity and longshore drift), generally coarser grained than the WIM150-style deposits, making them easier to process; in addition, given the geological history of the region, they generally have only shallow cover, which in the case of BPL's projects ranges from 5m to 30m thick - at Jaws/Gilligan this is the Blanchetown Clay.
- ◆ They can also contain very high amounts of valuable heavy minerals; an example is Iluka's West Balranald Project, which has close to 28% valuable heavy minerals (although the depth of ~50-70m below surface will affect the economics of any potential operation), making it one of the highest value per tonne of sand deposits globally.
- ◆ In addition, these deposits commonly contain significant proportions of the higher value rutile and zircon.

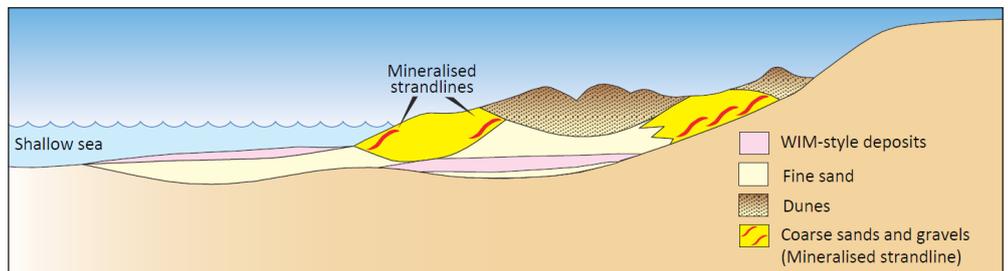
- ◆ The considerable amount of work over the basin has identified numerous strandlines (Figure 11), including a number in BPL's tenements (Figure 1).

Figure 11: Murray Basin Mineral Sands Province, showing selected deposits



Source: WIM Resources Pty Ltd website, extracted June 18, 2018

Figure 12: Diagrammatic section through a barrier system, showing main deposit styles



Source: Victorian Department of Economic Development, Jobs, Transport and Resources

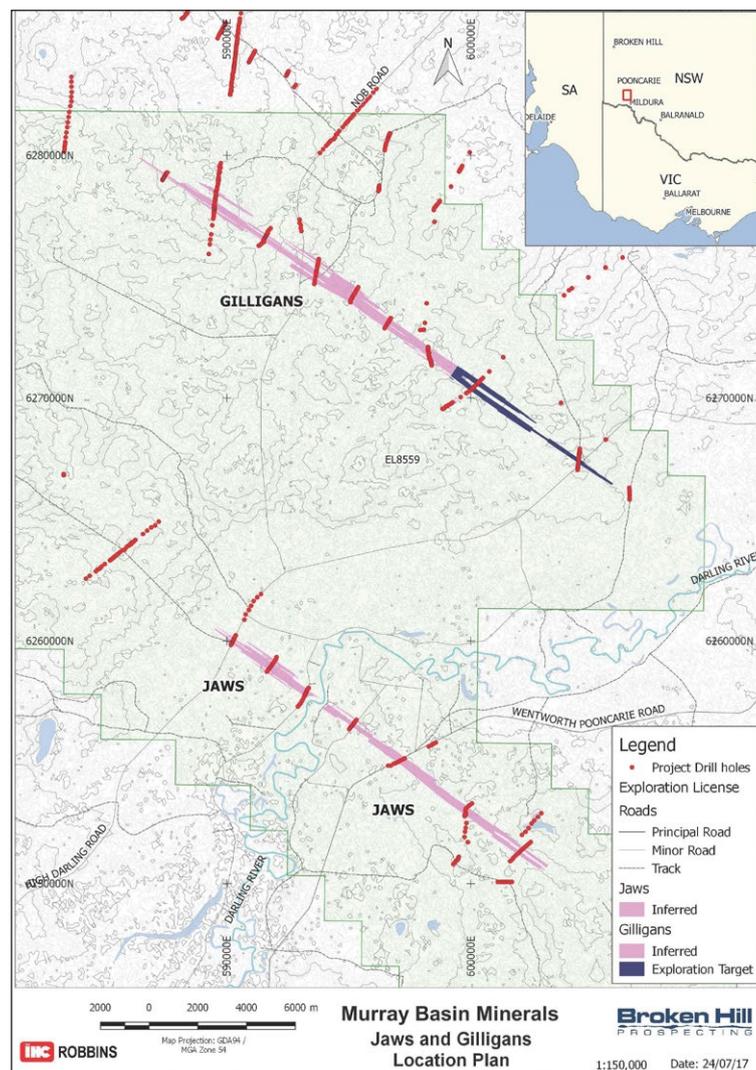
WORK BY BPL

- ◆ The main work completed to date has been the data compilation and review, resulting in the major database of over two million metres in 60,000 holes as now held by the Company.
- ◆ A key outcome of this work has been that it has been a low cost “discovery” exercise.
- ◆ This database, which the Company estimates represents ~A\$100 million of exploration expenditure, has identified a number of deposits which the Company is in the process of undertaking data verification on, and, where possible, estimation of JORC-2012 compliant Resources as is the case for Jaws and Gilligans as discussed below.

Resource Estimation - Jaws and Gilligan

- ◆ The Jaws and Gilligan deposits are located within EL8559, immediately north of the town of Wentworth in southern NSW (Figures 1 and 13) with infrastructure readily available.
- ◆ The deposits were originally drilled (using air core drilling) by Iluka (then Westralian Sands) between 1998 and 2005, with the work identifying two parallel, en echelon strandlines with strike lengths of up to 15km, with the deposits being up to 150m wide across strike and up to 10m thick.
- ◆ Inferred Resources have been estimated for both strandlines, with an additional Exploration Target being calculated for Gilligans - these are shown in Table 6.

Figure 13: Jaws and Gilligans deposit location and drilling



Source: BPL

Table 6: Gilligan and Jaws JORC 2012 compliant MRE and Exploration Target

Gilligan and Jaws JORC 2012 compliant MRE						
Mineral Resource Category	Deposit	Material (Mt)	In Situ HM (Mt)	HM (%)	Clay (%)	Oversize (%)
Inferred	Jaws	63	1.2	1.9	5	1
Inferred	Gilligans	50	0.8	1.6	2	2
Total		113	2	1.8	3	1
Exploration Target	Gilligans	45	0.1 - 0.3	1 - 2	7 - 8	1
Mineral Resource Category	Deposit	Ilmenite (%)	Zircon (%)	Rutile (%)	Magnetic Leucoxene (%)	Non-magnetic Leucoxene (%)
Inferred	Jaws	10	10	29	22	1
Inferred	Gilligans	8	9	23	20	2
Total		10	10	26	21	2
Exploration Target	Gilligans	8	9	3	20	2

Source: BPL - Note: Rounding errors may occur

- ◆ Although the total resource grades are relatively low when compared with peers, the deposits have a high value mineral assemblage (Appendix 2), leading to in ground values (particularly for Jaws at US\$11/tonne) near the tonnage weighted mid point of peers of US\$13/tonne, however with relatively high basket prices of close to US\$800/tonne valuable heavy minerals.
- ◆ In calculating the weighted average, we have used the deposits listed in Appendix 2, however have omitted the top two - Iluka's West Balranald deposit, which is an outlier, and the total Iluka Murray Basin resources which are influenced by Balranald.
- ◆ Given the wide spaced drilling, further drilling is required at Jaws and Gilligans, which may well result in the definition of higher grade zones of mineralisation which would make any future operation more attractive.

UPCOMING WORK

- ◆ Cobalt Blue will continue advancing the TCP to a BFS, with metallurgy being one of the key focus areas - this may include building a pilot treatment plant to assess the performance of an upscaled process.
- ◆ A pilot plant will also be required to produce "on-spec" samples for potential offtakers; this will also be critical in demonstrating that impurities can be removed during the purification test work which was limited in the PFS.
- ◆ BPL's current activities are concentrated on both the Murray Basin HMS and Broken Hill exploration projects, however with areas of the Thackaringa area being quarantined from June to August due to lambing.
- ◆ Also at Thackaringa, Cobalt Blue is required to sterilise a large mine footprint area, which will involve IP geophysics and RAB/RC drilling which will test a number of BPL's precious and base metal targets at Cobalt Blue's cost.
- ◆ BPL has a comprehensive programme to work up Broken Hill Group and Thackaringa Group targets away from the proposed mine site and on the recently granted tenements, with planned activities including geological mapping, geochemistry, geophysics and RAB drilling to prove up drill targets.
- ◆ In the near term planned work will include:
 - Induced polarisation ("IP") surveying at the Himalaya North and Pyramid Hill Broken Hill Group targets, with an aim to identify strike and dip extensions to the known near surface mineralisation; and,
 - Geochemical sampling and mapping over prospects with a diverse range of styles and metal associations within the Thackaringa Group.
- ◆ In the Murray Basin, the Company is currently reprocessing recently acquired high resolution magnetic data over the Victorian projects that will be used in targeting areas for further work.
- ◆ The finalisation of the data compilation (which includes identified mineralisation dropped by Iluka) and assessment will result in decisions on future work programmes.

PEER GROUP ANALYSIS

- ◆ Given the mix of mineralisation styles, BPL is unique amongst ASX-listed explorers and developers - peer groups we could compare the company to include diversified explorers, cobalt developers and HMS explorers and developers.
- ◆ Given the current focus on activities, we will compare BPL against companies operating in both the HMS and diversified explorers space; given the structure of the Cobalt Blue agreement and assuming development of the TCP, our view is that BPL, with a royalty interest only, is not a true cobalt player per se.
- ◆ Our view is that this is reflected in the comparative market capitalisation of COB and BPL.

HMS OPERATORS

- ◆ BPL is one of a handful of HMS explorers, producers and developers listed on the ASX, with these shown in Table 7 - this highlights the low EV of BPL, and the potential for uplift with exploration and development success.
- ◆ Mineral sands can be a frustrating game in the market, with investors generally not being excited by the space until material progress is made towards development.

- ◆ However recent success stories include Sheffield Resources, which has seen a doubling of the share price since September 2017 on the back of offtake agreements, and advances in financing and permitting for the 100% held Thunderbird Project in Western Australia.

Table 7: ASX listed HMS companies

ASX listed HMS companies							
Company	Key Project	Stage	Equity Share	EV ¹	Global Resources - All Deposits	Global Payable HM Grade ²	Contained Payable HM
Iluka Resources	Various	Producing	100%	\$4,938.9 m	3,144 Mt	4.44%	139.7 Mt
Base Resources	Kwale, Kenya	Producing	100%	\$389.7 m	1,004 Mt	4.57%	45.9 Mt
Mineral Deposits	Grande Cote, Senegal	Producing	45%	\$329.1 m	1,847 Mt	1.23%	22.8 Mt
Sheffield Resources	Thunderbird, WA	Financing	100%	\$168.1 m	7,225 Mt	1.98%	143.3 Mt
MZI Resources	Keysbrook, WA	Producing	100%	\$161.7 m	147 Mt	1.66%	2.4 Mt
Strandline Resources	Various, Tanzania	Exploration, resources estimated	100%	\$47.6 m	477 Mt	1.52%	7.2 Mt
Diatreme Resources	Cyclone, WA	PFS complete	100%	\$23.9 m	204 Mt	1.71%	3.5 Mt
Astron Corporation	Donald, Murray Basin Victoria	Optimisation of FS	100%	\$20.9 m	4,780 Mt	2.92%	139.7 Mt
Broken Hill Prospecting	Murray Basin	Exploration, resources estimated	100%	\$8.1 m	113 Mt	1.22%	1.4 Mt
Metallica Minerals	Point Urquart, Queensland	On hold	50%	\$5.2 m	3 Mt	2.01%	0.1 Mt

1: EV is defined as market capitalisation less cash plus debt – no allowance has been made for the value of non-HMS projects in the companies' portfolios - we have EV, and not market capitalisation, given significant debt in some companies.

2: Payable grade is the published grade of valuable zircon and titanium dioxide minerals

3: Strandline's mineralisation includes the 308Mt Coburn deposit in Western Australia – activities however are largely focussed on Tanzania.

- ◆ Of these, all but BPL, Diatreme and Metallica are concentrating solely on mineral sands; BPL has the Broken Hill assets, Diatreme has base metal and gold assets in Queensland and Metallica the Point Urquart bauxite deposit.
- ◆ Possibly the closest analogues to BPL may be Diatreme and Strandline Resources, with the former having the Cyclone deposits in Western Australia, with Diatreme's PFS estimated an up front capex of A\$223 million, highlighting different strategies .
- ◆ Strandline has a number of HMS concessions along the Tanzanian coast containing strandline mineralisation; we note however that Strandline is also looking to develop the Coburn deposit in Western Australia.
- ◆ The most advanced of Strandline's Tanzanian assets is Fungoni, for which a relatively modest start up operation is envisaged using modular/mobile equipment, and for which development studies have indicated a capex of US\$30 million (A\$40 million at the current exchange rate); this equipment will then be able to be relocated to exploit additional deposits as they are proved up and permitted - this is a similar strategy to what BPL is considering in the Murray Basin.
- ◆ Another similarity is the similarity in the in-ground value of Resources for Jaws (BPL) and Fungoni (Strandline), both just under US\$11/tonne of ore as shown in Appendix 2.
- ◆ We note the higher grade of the Fungoni Reserves (3.89% HMS vs 2.82% HMS for the Resources), however Strandline has not published the valuable heavy mineral mix for the Reserves.

DIVERSIFIED EXPLORER PEERS

- ◆ Table 8 presents data on a number of ASX-listed companies with diversified exploration assets.
- ◆ We have chosen companies largely operating in NSW, with some companies active in Victoria and South Australia.
- ◆ The average market capitalisation of these (excluding Peel and Ardea, which have advanced projects/resources) is ~A\$20 million, 33% higher than BPL.

- ◆ The value uplift with the explorers comes with discovery; the example here is Peel Mining which saw more than a doubling of its share price from A\$0.21/share in October 2017 to a peak of A\$0.75/share in February 2018 on the back of high grade polymetallic drilling results at Wagga Tank - it has since retreated to A\$0.50/share.
- ◆ Other notable examples over the past 10 years include the De Grussa Cu-Au (Sandfire Resources) and Nova-Bollinger Ni-Cu (Sirius Resources) discoveries in Western Australia - both of these discoveries resulted in around 100x share price increases.

Table 8: BPL peers - diversified explorers

BPL peers - diversified explorers						
Description	MC	Precious Metals	Base Metals	Specialty Metals	Jurisdictions	Notes
Ardea Resources Ltd	\$86.4				NSW, WA	Lewis Ponds polymetallic
Peel Mining Limited	\$80.9				NSW	Cobar Basin polymetallic discoveries
Collerina Cobalt	\$53.4				NSW	Fifield style laterite, HPA
Stavely Minerals Ltd	\$33.0				VIC	Stavely porphyry
Emmerson Resources	\$31.6				NSW, NT	Various Macquarie Arc Exploration Areas
Red Metal Limited	\$24.2				WA, QLD, SA, NT	Not in NSW
Impact Minerals	\$17.2				WA, NSW	Commonwealth Hill polymetallic
Minotaur Exploration	\$13.6				SA, Qld, WA	Includes industrial minerals
Broken Hill Prospect	\$10.4				NSW	Broken Hill, Murray Basin
Rimfire Pacific	\$9.4				NSW	Fifield Project
Argent Minerals	\$8.8				NSW	Kempfield polymetallic
Golden Cross	\$7.9				NSW	Copper Hill Porphyry
Thomson Res Ltd	\$4.4				NSW	Bygoo tin
Magmatic Resrce Ltd	\$4.4				NSW	Macquarie Arc Exploration

Source: IRESS, Company Reports, IIR analysis

CAPITAL STRUCTURE

- ◆ BPL currently has 147.79 million ordinary shares, 46.58 million listed A\$0.08 options and 7.90 million long dated unlisted options with strike prices ranging from A\$0.06 to A\$0.10.
- ◆ 2.9 million options are in the money, with the potential to bring in A\$0.17 million if exercised.
- ◆ The top 20 hold 53.12%, with board and management holding 34.79%.
- ◆ The top holder is Non-Executive Director Mr Geoffrey Hill, with 32.82% of the listed shares through both direct and indirect holdings.

VALUATION/TARGET PRICE

Summary

- ◆ We have completed a sum of the parts indicative valuation for BPL, with this presented in Table 9.
- ◆ This includes a risked DCF valuation for the TCP NSR royalty, and nominal valuations for the other projects, based on the enterprise values of similar companies; cash is of March 31, 2018, and option cash is the cash due on the conversion of current in money options - we have also diluted the current shares on issue to allow for conversion of the 52.5 million options that are currently in the money.
- ◆ We have discounted the final TCP payment of A\$75 million at 8% pa from June 30, 2020, and applied the same risk factor as we have for the TCP royalty.

Table 9: BPL indicative price target - AUD

BPL indicative price target - AUD						
Item	Total	Total/Share	Risk Factor	Risked	Risked/Share	Notes
TCP Royalty	\$20.21	\$0.134	30%	\$6.06	\$0.040	NPV ₈ , Based on upside production case
Financial Closure	\$6.43	\$0.043	30%	\$1.93	\$0.013	Risked NPV ₈ of \$7.5m
Broken Hill Exploration	\$10.00	\$0.066	100%	\$10.00	\$0.066	Nominal, peers
Murray Basin Exploration	\$15.00	\$0.100	100%	\$15.00	\$0.100	Nominal, peers
Cash	\$2.09	\$0.014	100%	\$2.09	\$0.014	30/06/2018
Option Cash	\$0.17	\$0.001	100%	\$0.17	\$0.001	
Total	\$53.90	\$0.36		\$35.08	\$0.233	~150.7m shares

Source: IIR analysis

TCP Valuation

- ◆ We have completed a DCF valuation of the TCP with the purpose of valuing BPL's NSR, which is dependent upon the successful development of the Project
- ◆ In this we are assuming that Cobalt Blue completes the requirements of the Farm-In and Royalty Agreement, and hence we have not ascribed any value of the Project, apart from the NSR (and the A\$75 million payment upon COB earning 100%), to BPL.
- ◆ In completing our valuation inputs are those as largely used by the JV in the PFS, and hence we won't reiterate them here; we have however used an AUD:USD exchange rate of 0.75, in contrast to the figure of 0.70 used in the PFS.
- ◆ We have used the upside, 13 year mine life case, with our model giving similar outcomes as those presented in the PFS when we used an ER of 0.70 - our key outcomes are using an ER of 0.75 are presented in Table 10.

Table 10: Thackaringa DCF key inputs and outcomes

Thackaringa DCF key inputs and outcomes		
Description	Unit	Value
Mine Life (Exc Construction)	Years	13
Total Ore Mined	Tonnes	58,774,903
Cobalt Produced	Tonnes	40,331
Average Cobalt Sales Price	US\$/lb	\$32.90
Sulphur Produced	Tonnes	3,301,406
Average Sulphur Sales Price	US\$/t	\$145
Exchange Rate	AUD:USD	0.75
Average Cobalt Sales Price	A\$/lb	\$43.87
Average Sulphur Sales Price	A\$/t	\$193.33
Company Tax Rate	%	30.0%
NSW Royalty Rate	%	4.0%
BPL Royalty Rate	%	2.0%
NPV, mid-year, Pre-Tax	A\$m	\$625 m
IRR, Pre-Tax	%	24%
NPV, mid-year, Post-Tax	A\$m	\$386 m
IRR, Post Tax	%	19%
LoM Revenue	A\$m	\$4,538 m
LoM Opex (Inc Royalty)	A\$m	\$2,230 m
LoM EBITDA	A\$m	\$2,308 m
LOM Interest	A\$m	\$0.0 m
LOM Tax	A\$m	\$472 m
LoM Capex	A\$m	\$732 m
LoM FCF	A\$m	\$1,534 m
Peak annual FCF	A\$m	\$222 m
Peak Annual EBITDA	A\$m	\$236 m
Discount Rate	%	8.00%

Source: IRR analysis

- ◆ As part of our valuation we completed a sensitivity analysis as included in Tables 11 and 12, which is shown for the pre-tax NPV.
- ◆ Table 10 shows the sensitivity to various inputs, and as can be seen the Project is very sensitive to changes in revenue factors, including the cobalt price and grade, which can also be considered a proxy for metallurgical recoveries and exchange rates.
- ◆ It is also very sensitive to operating costs, and as such we have included a table with the combined sensitivity to cobalt price and operating costs (Table 12).

Table 11: TCP pre-tax sensitivity

TCP sensitivity					
Change	Co Price	S Price	Co Grade	Site Costs	Capex
-20%	A\$207m	A\$541m	A\$210m	A\$824m	A\$734m
-10%	A\$407m	A\$574m	A\$408m	A\$716m	A\$670m
0%	A\$607m	A\$607m	A\$607m	A\$607m	A\$607m
10%	A\$806m	A\$640m	A\$805m	A\$498m	A\$543m
20%	A\$1,006m	A\$673m	A\$1,004m	A\$389m	A\$479m

Source: IIR analysis

Table 12: TCP pre-tax price/costs sensitivity

TCP pre-tax price/costs sensitivity						
Change in Site Operating Costs						
	\$606.70	-20%	-10%	0%	10%	20%
Co price US\$/lb	US\$20	A\$41m	-A\$68m	-A\$177m	-A\$286m	-A\$395m
	US\$25	A\$345m	A\$236m	A\$127m	A\$18m	-A\$91m
	US\$30	A\$648m	A\$539m	A\$431m	A\$322m	A\$213m
	US\$35	A\$952m	A\$843m	A\$734m	A\$625m	A\$517m
	US\$40	A\$1,255m	A\$1,147m	A\$1,038m	A\$929m	A\$820m
	US\$45	A\$1,559m	A\$1,450m	A\$1,341m	A\$1,232m	A\$1,124m

Source: IIR analysis

- ◆ Our base case values the BPL royalty at A\$42.2 million pre discounting, with an unrisks NPV of A\$20.2 million, using calculations as used by Cobalt Blue, and presented earlier in this report.
- ◆ There is a case that there may be upside to this - there could be an argument that costs (including D and A) related to the comminution and concentrating of the ore should not be a royalty deduction given the definition of the royalty as a "net smelter return"; these costs would also include those related to the tailings storage facility.
- ◆ Applying an adjustment of 30% (this is a "guesstimate" only, however our calculations indicate that ~30% of the capex could be attributable to comminution, flotation and tails) to the operating cost and D and A deductions results in the royalty increasing to A\$52.2 million, with an NPV of A\$25.2 million
- ◆ The sensitivity of the royalty to the cobalt price and operating costs is shown in Table 13.

Table 13: BPL NSR price/costs sensitivity

BPL NSR price/costs sensitivity						
Change in Site Operating Costs						
	\$606.70	-20%	-10%	0%	10%	20%
Co price US\$/lb	US\$20	A\$9.25m	A\$8.20m	A\$7.16m	A\$6.12m	A\$5.07m
	US\$25	A\$14.21m	A\$13.12m	A\$12.03m	A\$10.94m	A\$9.85m
	US\$30	A\$19.32m	A\$18.20m	A\$17.08m	A\$15.96m	A\$14.83m
	US\$35	A\$24.54m	A\$23.39m	A\$22.24m	A\$21.10m	A\$19.95m
	US\$40	A\$29.82m	A\$28.65m	A\$27.49m	A\$26.32m	A\$25.15m
	US\$45	A\$35.15m	A\$33.97m	A\$32.78m	A\$31.60m	A\$30.42m

Source: IIR analysis

RISKS

- ◆ **Exploration:** This is the key risk for BPL (and for any junior explorer for that matter), particularly at the Broken Hill exploration projects (but not including the more advanced TCP).
- ◆ **Metallurgy:** Technical success at the TCP hinges on the metallurgy, with the planned processing being reasonably complicated and using some proprietary technology. This has yet to be proved in any volume, and thus the planned pilot scale work will be vital in proving or otherwise the viability of the process to deliver “on-spec” product.
- ◆ **Resource Definition:** This is pertinent with regards to the Murray Basin, in that the Company will be looking to define Resources from existing data, augmented where required by new drilling - given that the mineralisation has already been “discovered” in a number of areas, the risk will be proving up the grade and size of Resources over a number of deposits that will justify considering development.
- ◆ **Permitting:** With regards to exploration, this is largely with the most Exploration Licences now being issued. This however will come into play when and if the Company looks to develop any of the Murray Basin deposits; the key factor here may be delays in permitting rather than a failure to permit - the region does have a history of HMS mining. This will also affect development of the TCP.
- ◆ **Markets and Funding:** Although relatively buoyant at the moment, markets can turn on a dime and funding for and sentiment towards juniors can dry up very quickly. The Company currently has ~A\$2.1 million in cash with an annual cash burn of ~A\$1.5 million per year, and thus, unless exploration programmes are significantly accelerated we would see the Company going back to the market in ~12 months.
- ◆ **Commodity Prices:** This is largely linked to the above, with changes in commodity prices affecting the various sectors of the resources markets. With mineral sands and cobalt, BPL is operating in two of the more unpredictable commodities, which, down the track, could affect project financing.

BOARD AND MANAGEMENT

- ◆ **Mr Creagh O'Connor AM, FAIM, FAICD - Non-Executive Chairman:** Creagh has approximately 40 years experience as a chief executive and board member for a number of public and private companies. During this time he has been involved in managing a number of Australian and international oil, gas and mineral projects.

Creagh is an experienced board member and his most public role was with Cricket Australia as Director for 11 years and Chairman from 2005 to 2008.

In addition he was Director of South Australian Cricket Association (SACA), Director of the International Cricket Council, Director of the Kerry Packer Cricket Foundation, Director of Rundle Capital Ltd, Governor of the Bradman memorial fund, Chairman of the Lords Taveners, Trustee of the Les Favell Foundation and Chairman of ACHA Health Ltd.

He is currently a director of A G O'Connor Pty Ltd and chairman of the Maurice de Rohan International Scholarship Fund.

- ◆ **Mr Trangie Johnston BSc (Hons), MSC, MAusIMM – Managing Director:** Trangie Johnston is a geologist with 22 years' experience in exploration, project development and mining activities. His diversified career spans the private, public, consulting and government sectors, with experience extensively throughout Australia and internationally. He was previously a director of Cobalt Blue Holdings and has also previously held corporate and senior management positions at KBL Mining Limited, MM Mining Limited, Compass Resources Limited and SRK Consulting Pty Ltd.

Trangie is experienced in a diverse range of ore deposit types, commodities and operations and has a sound understanding of Industry best practice. He has previously implemented programs for resource and reserve expansion through maiden discoveries and deposit extensions across the base and precious metals, bulks, energy and rare earth markets.

- ◆ **Mr Geoffrey Hill BEc, MBA, FCPA, ASIA, FAICD – Non-Executive Director:** Geoff was a director of BPL from 1989 to June 2014, and re-joined the board on 27 August 2015. He has extensive experience in the identification and implementation of mergers and takeovers and has acted for a wide range of corporate clients in Australia and overseas. Mr Hill also has extensive experience in giving corporate advice to mining companies.

He is a director of unlisted companies including International Pacific Capital Limited, So Co Ltd, Coromandel Gold Limited and Texas and Oklahoma Coal Company Limited. Listed company directorships include Metals Finance Corporation Limited (MFC) and Mount Gibson Iron Limited (MGX). He is a former director of Heritage Gold NZ Limited (now New Talisman Gold Mines Limited) (1999-2012).

- ◆ **Mr Matthew Hill MBA, AFSL, FFIN, APDT – Non-Executive Director:** Matthew has over 20 years experience in financial services and investment banking. He is currently the Chief Executive Officer of New Talisman Gold Mines Limited (formerly Heritage Gold NZ Limited), the Executive Director of International Pacific Capital Limited and Managing Director of Asia Pacific Capital Group Limited. Matthew is an experienced merchant banker having worked previously at Potter Warburg, Eventures (a joint venture between Newscorp and Softbank), Pitt Capital and Souls Private Equity Limited.

Matthew specialises in resource and company listings on the ASX and NZX and acts for a number of multinational clients. Matthew holds a Graduate Diploma in Applied Finance and Master of Business Administration. He is a fellow of the FINSIA and a member of the Australian Institute of Company Directors.

- ◆ **Mr Denis Geldard AWASM, MAIMM – Non-Executive Director:** Denis has over 40 years technical and operational experience in mineral exploration and project development in Australia and internationally. He has over 20 years' experience in the Heavy Mineral Sands Industry with companies such as Western Titanium Ltd, Associated Minerals Consolidated and Iluka Resources.

Denis is a Mining Engineering graduate from the Kalgoorlie School of Mines in Western Australia. He has managed and run a number of junior and mid-tier mining and exploration companies and mining operations over the past 40 years including directorships of a number of Australian listed mining and exploration companies.

BACKGROUND - COBALT AND MARKETS

- ◆ This section presents a brief summary of cobalt and markets - readers should refer to other sources for more detailed information, particularly regarding the different types of batteries and their raw material requirements.

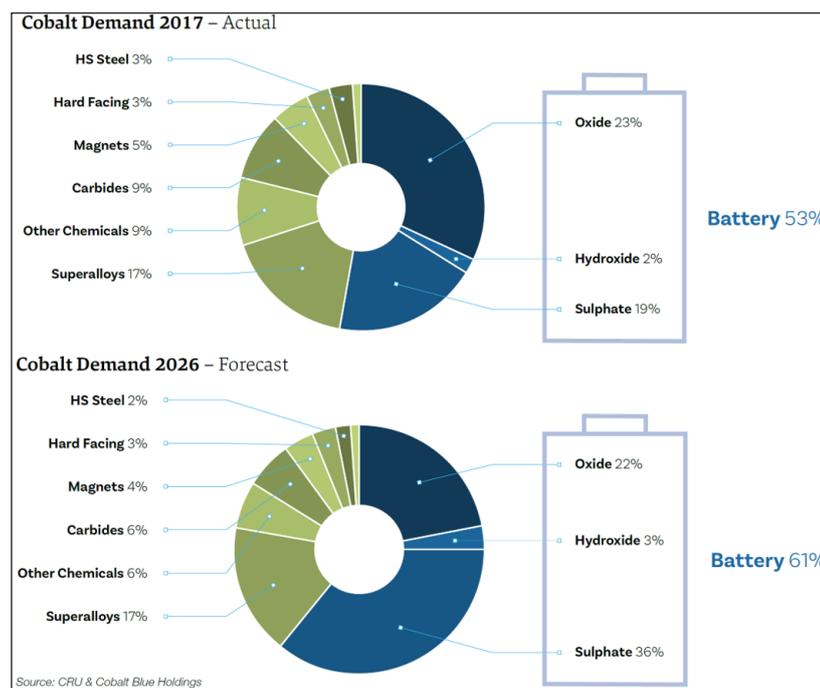
Uses

- ◆ Cobalt is a lustrous, greyish-silver metal with a high melting temperature (1,495° C), and retains its strength at high temperatures.
- ◆ It is one of only three naturally occurring magnetic metals (along with Fe and Ni), and can be alloyed with other metals, commonly to make so called "superalloys".
- ◆ It has a wide range of chemical and metallurgical uses as shown in Figure 14, with the major use being in batteries - it is expected that demand for batteries, particularly in electric vehicles, will drive overall demand for cobalt in coming years.

Production

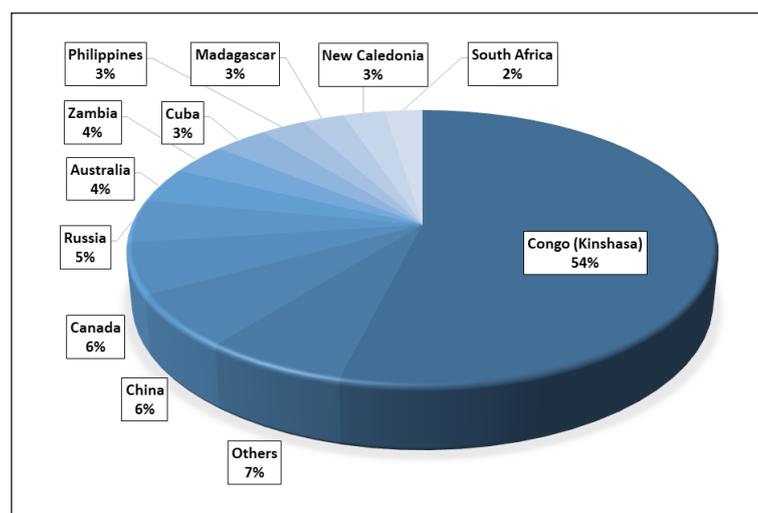
- ◆ A notable feature of cobalt is that 99% of mine production is as a by-product of copper (~67%) or nickel (~32%), with only 1% from primary production.
- ◆ The majority of the copper associated production is in copperbelt style mineralisation, hence the concentration of production from the DRC (Congo-Kinshasa), with some from Zambia.
- ◆ Nickel associated cobalt production is largely from laterites, with this including production from New Caledonia, Madagascar, the Philippines and Cuba; cobalt is also a by-product of primary magmatic nickel deposits, including Sudbury in Canada.
- ◆ These are important points, in that cobalt supply is affected by the prices and hence production of nickel and copper.
- ◆ Figure 14 presents a breakdown of the 2016 mine production of an estimated 123,000t by country - this highlights the dominance of the DRC, with 54% of mine production.

Figure 14: Cobalt demand - 2017 (actual) and 2026 (forecast)



Source: Cobalt Blue

Figure 15: 2016 mine production



Source: USGS

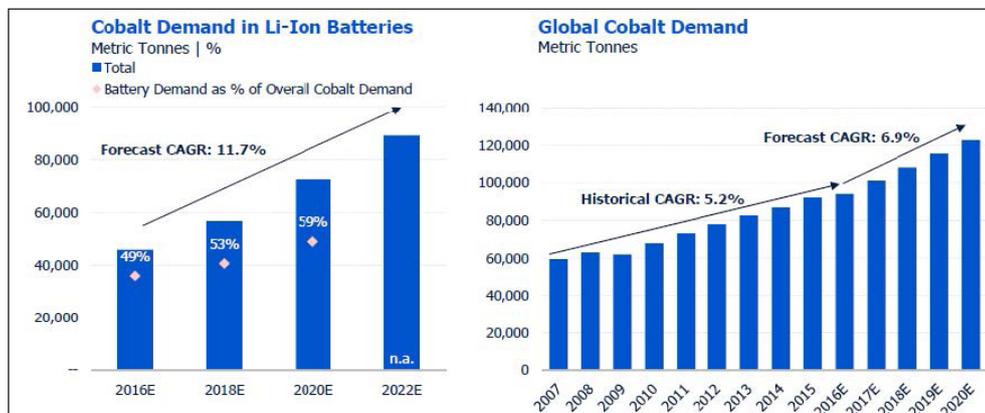
- ◆ Mine production is also concentrated amongst producers; it has been estimated that Glencore produced some 24% of cobalt in 2016, mainly from Mutanda in the DRC, with China Moly contributing some 16% of global production from the Tenke operation in the DRC.
- ◆ There is significant latent capacity in the DRC, with the potential to add ~50kt over the next few years, including 34kt with the restart of Glencore’s Katanga operation on which operations were suspended in September 2015; this was partially restarted in December 2017, with plans to produce 11,000t of cobalt in CY2018, ramping up to 34,000t in CY2019.
- ◆ However this is at least partially offset by political and sovereign risks, with potential for supply disruptions; as such some end users may look for supply outside of this volatile region; this will also be affected by end users looking for “ethical” supply.

Demand

- ◆ Forecasters see overall cobalt demand being driven by the demand for Li-ion batteries, with cobalt being used in three main battery types due to its high energy density - this demand is presented in Figure 16.

- ◆ This shows forecast battery requirements doubling from 2016 levels by 2022, a CAGR of just under 12%- this does rely largely on assumed penetrations of electric vehicles into the overall vehicle market - forecasts range widely from ~20 million vehicles in 2030 to 140 million vehicles.
- ◆ The overall growth is forecast at 6.9% out to 2022, resulting in refined cobalt demand of over 120,000tpa - this follows on from robust growth of 5.2% CAGR from 2007 to 2016, driven by the growth in batteries.

Figure 16: 2016 mine production



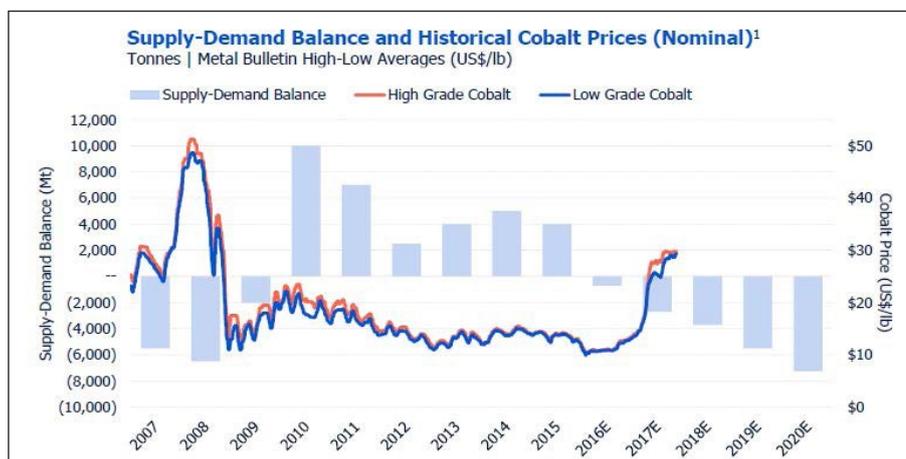
Source: Darton Commodities in UBS Global Research

- ◆ Factors that may affect cobalt demand, in addition to the expected growth in battery usage, include substitution driven by increasing cobalt prices.
- ◆ Given the high cost battery producers are looking at different battery types, else decreasing the amount of cobalt in the batteries.
- ◆ As an example this has already led to a change in the composition of the popular, high energy density nickel-manganese-cobalt (“NMC”) battery - the simplest is the NMC111 chemistry, with Ni:Mn:Co in the ratio 1:1:1, however more recent developments include the NMC622 and NMC811 compositions, with higher energy densities and lower costs due to the lower cobalt contents.
- ◆ However this latter battery chemistry is yet to be widely accepted (there are issues with heat generation amongst others), and this, along with long development times for other, new battery chemistries should not affect anticipated demand for cobalt in the foreseeable future.

Pricing

- ◆ Cobalt is characterised by highly volatile pricing, and reacting to stock levels - this is shown in Figure 17.
- ◆ This highlights the recent price rises, with the metal moving from US\$22,000/tonne to over US\$100,000/tonne coincident with supply deficits and increasing demand, and has now retreated to ~US\$55,000/tonne.

Figure 17: Pricing and supply/demand balance



Source: Darton Commodities, Cobalt27, Metal Bulletin in UBS Global Research

- ◆ How pricing may play out in the future is hard to predict, with conflicting thoughts in the market place, however most commentators are bullish, with, as mentioned previously, long term forecasts ranging up to US\$90,000/tonne, and more commonly in the range US\$50,000 to US\$70,000/tonne (US\$23.70/lb to US\$31.80/lb).
- ◆ One major unknown is the DRC, including the effect of the Katanga (and other) operations coming back on stream, however it would be expected that Glencore will ramp up production in a measured way to support prices.
- ◆ Given the forecast demand growth and potential for future supply risks, additional projects are required going forward, and these will rely on strong metals prices to be developed.

BACKGROUND – THE MINERAL SANDS INDUSTRY

Introduction

- ◆ The mineral sands industry is the key supplier of zircon and titanium dioxide minerals worldwide - these are key feedstocks for industrial uses, with Australia being a major global producer, particularly of zircon.
- ◆ In 2014 global production included 1.1Mt of zircon and 7.25Mt of titanium dioxide feedstock.

Zircon

- ◆ The zircon market is supplied by the one product, zircon.
- ◆ The major use for zircon is in ceramics, with this comprising some 50% of the 2014 global demand of 1.1Mt, with approximately 90% of the ceramics demand from tile manufacture.
- ◆ Other uses include chemicals (21%) and in refractory products (17%) - the chemical demand is currently the largest growing, with a 10 year CAGR of 11%.
- ◆ China is the largest market, comprising 40% in 2014, with this region seeing significant growth, largely due to the rapid urbanisation during the 2000's driving increased demand for tiles and other ceramics – tiles comprise approximately 75% of all floor coverings in China (source: Iluka).
- ◆ Other major markets include Europe (20% in 2014) and North America (9% in 2014).
- ◆ Urbanisation is seen to be the key driver of zircon demand, largely due to increasing demand for tiles and other ceramic products.
- ◆ Australia is the largest supplier globally, providing 43% of the world's production in 2014, with Iluka alone supplying 32% of the global demand.
- ◆ Australia's (and Iluka's) shares of global production were significantly down on the 2011 figures (50% and 38% respectively), largely due to weakening demand and lower prices.

Titanium Dioxide

- ◆ The majority (90%) of titanium dioxide is used in the pigment industry, being used in various products, including paints, coatings, paper and inks.

Table 14: Titanium dioxide products sold, 2014

Titanium dioxide products sold, 2014			
Product, approximate market share	TiO ₂ %	Notes	End Uses
Rutile – 10%	95-97	Mined product	Pigments, metal
Synthetic rutile – 3%	88-95	Upgraded from ilmenite in a furnace	Pigments
Ilmenite			
Sulphate – 42%	52-54	Processed to pigment - sulphate processing	Pigments
Chloride – 12%	8-62	Processed to pigment - chloride processing	
Slag			
Sulphate – 11%	80-85	Upgraded from sulphate ilmenite in a furnace	Pigments
Chloride – 19%	85-90	Upgraded from chloride ilmenite in a furnace	
Upgraded – 3%	95	Upgraded from ilmenite	

Source: Iluka

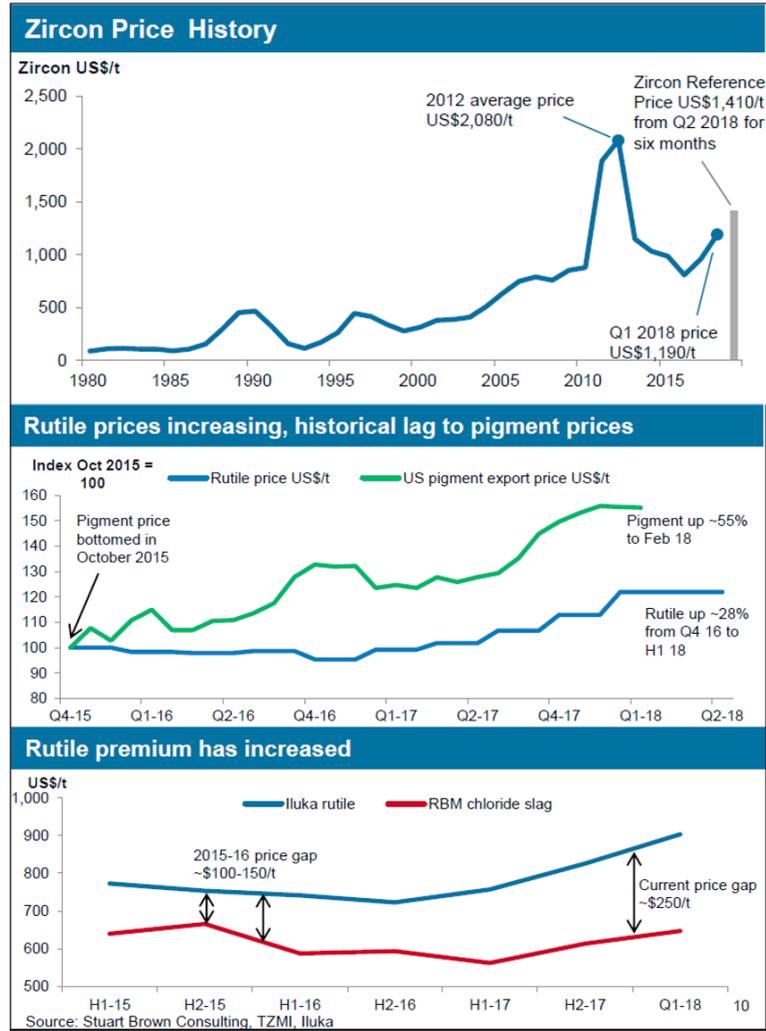
- ◆ It is a key white pigment in that it has a high refractive index (whiteness), provides UV protection and is non-toxic.
- ◆ Other uses include as a metal (military, aerospace and specialty applications) and for welding rod core wire.

- ◆ There are two main pigment production routes – chloride and sulphate, with chloride generally being cleaner and requiring higher grade feedstocks.
- ◆ The majority of Chinese capacity is for sulphate grade feedstock; western producers generally use the chloride process.
- ◆ In 2014 (total production 7.25Mt) the major titanium dioxide producers were China (19%), Australia (17%), South Africa (15%) and Canada (11%).
- ◆ Like zircon, Australian share of production had fallen from 24% of 6.5Mt in 2011 (1.6Mt) to 17% of 7.25MT in 2014 (1.2Mt), again largely due to Iluka curtailing production and sales.
- ◆ Rio Tinto (24% in 2014) is the largest producer, with operations in South Africa (Richards Bay), QIT (Canada) and QMM (Madagascar).
- ◆ In 2014 Iluka was the second largest producer (9%), with operations in Australia and Virginia in the US – the latter was idled at the end of 2015 and closed in 2016.
- ◆ Unlike zircon, where the market is supplied by a single product, the 7.25Mtpa (2014) titanium dioxide market is fed by a number of products feeding the different processing routes.
- ◆ Key products sold by producers are shown in the table below. What can be seen is that 36% of the products sold to end users and pigment manufacturers are upgraded products, with the remaining 64% being raw materials.
- ◆ In addition, approximately 52% of feedstocks are chloride grade and 48% sulphate grade.

Pricing

- ◆ The mineral sands market is relatively opaque – prices are generally fixed between the producer and buyer, and until 2009-2010 were largely on long term contracts, leading to relatively stable prices.
- ◆ More recently, changes in demand and supply have led to contracts more commonly being negotiated quarterly or half yearly.
- ◆ Zircon and rutile prices, and the relative performance of pigment and rutile pricing are shown in Figure 18 - changes in ilmenite and leucoxene prices will reflect those of rutile, albeit at a lower levels.
- ◆ This highlights the recent recoveries in prices.
- ◆ The noticeable feature is the zircon price (which is reflected in the other valuable HMS minerals) is the sharp decrease in prices in 2013, which continued into 2016 – this followed slowing in demand during 2012, largely due to weakening global economic conditions.
- ◆ Also apparent are significant price increases in all commodities starting in 2010. As mentioned, this was as a result of supply constraints enabling producers to renegotiate prices away from long term contracts, which were a disincentive on bringing on new production.
- ◆ The steady increase in zircon price from 2000 to 2010 of around 12% CAGR was largely due to the rapid urbanisation in China driving demand for ceramics, and hence zircon - there was a minor blip during the GFC, largely due to non-Chinese factors.
- ◆ Until 2010 price increases in the titanium dioxide products tended to follow annual GDP growth of around 3%.
- ◆ Reduced prices in 2014-2016 saw curtailing of operations, and also, especially in the case of zircon, selling from stockpiles (particularly by Rio Tinto) which saw prices remain depressed.
- ◆ TZMI expect that in the case of sulphate ilmenite, feedstock inventories have peaked, and were depleted by early 2017, with this also coinciding with increasing demand, and with the possibility of no new operations coming on stream.
- ◆ They forecast that this will lead to a deficit of up to one million TiO₂ units (around 2 Mt of feedstock) by 2020-2021, with prices now increasing due to tightening markets.
- ◆ In addition, some Chinese supply has historically come as a by-product from domestic magnetite mines – with falling iron ore prices a number of these are closing and thus also affecting ilmenite supply.
- ◆ With regards to zircon, the forecast is for significant reduction in production from existing operations, with this pointing to a reduction in existing supply to ~750,000t by 2025 – this provides an excellent opportunity for new projects such as Thunderbird.
- ◆ This has followed a period where potential supply has been greater than demand due to overstocking and hence weighing on prices.

Figure 18: Zircon and Titanium Dioxide Prices



Source: Iluka May 2018 presentation

APPENDIX 1 - THACKARINGA JOINT VENTURE TERMS

Thackaringa Joint Venture Terms			
Stage	Original agreement	Revised Agreement	Status
Stage 1	Requires at least \$2.0 million to be spent on an approved, in-ground exploration program to define an Inferred Mineral Resource of 100 Mt and completion of a Scoping Study by 30 June 2017 to hold a 51% beneficial interest in the project.	<p>"For COB to retain the 51% beneficial interest, then during the period commencing ending no later than 1 April 2018, COB must:</p> <p>(i) Complete prior to 30 June 2017 a minimum \$2.0 million exploration program to define an Inferred / Indicated Mineral Resource of 54.5 million tonnes</p> <p>(ii) Complete after 30 June 2017 a further \$1.2 million exploration program to achieve an Indicated Resource of 40 million tonnes or such other tonnage as may be agreed unanimously by the JV committee</p> <p>(v) Complete prior to 30 June 2017 a Scoping Study</p> <p>(iv) Expenditure under (ii) and (iii) in aggregate must be not less than \$1.4 million and not greater than \$1.6 million</p> <p>(iii) Spend not less than \$0.2 million and not more than \$0.4 million to undertake an aerial geophysical survey of the JV mining tenements"</p>	Completed
Stage 2	Requires COB to fund a minimum \$2.5 million in-ground exploration program to define an Indicated Mineral Resource and complete a Pre-feasibility Study of the technical, commercial and economic feasibility of development and mining of cobalt by 30 June 2018. That work would earn COB an additional 19% interest.	<p>"For COB to earn an additional 19% interest, COB must have completed Stage 1 earning obligations during the period commencing on 1 July 2017 and ending no later than 30 June 2018:</p> <p>(i) A \$2.5 million approved exploration program within the JV area</p> <p>(ii) Complete a Pre-feasibility Study"</p>	Submitted, and currently being assessed by BPL
Stage 3	Stipulates COB can earn a further 15% interest by 30 June 2019 if it spends a minimum \$5 million on an in-ground exploration program to define a Measured Mineral Resource and Ore Reserve and complete a Bankable Feasibility Study.	No Change	
Stage 4	Enables COB to earn the final 15% interest in Thackaringa if it makes a decision to mine; procures necessary project approvals including financing; achieves financial close; and pays BPL \$7.5 million in cash no later than 30 June 2020.	No Change	
	BPL has also been granted a 2% net smelter royalty on all cobalt produced from the Thackaringa tenements for the life of the mine.	No change	

APPENDIX 2 - SELECTED HMS DEPOSIT DETAILS

Selected HMS deposit details										
Company	Project/Region	Deposit	Note	Total Tonnage	Total Grade	Total Ti Minerals %	Zircon Minerals %	Total Payable HMS %	IGV/t Ore USD ¹	Basket Value/t VHM USD ¹
ILU	Murray Basin	West Balranald	Resources	36 Mt	32.99%	24.01%	3.58%	27.59%	\$129.73	\$470.22
ILU	Murray Basin	Murray	Resources	189 Mt	16.83%	11.54%	1.81%	13.34%	\$66.82	\$500.89
Rele	Murray Basin	Kopi North	Resources	12 Mt	6.86%	5.28%	0.79%	6.07%	\$29.31	\$482.59
SFX	Eneabba, WA	West Mine North HG	Resources	10 Mt	7.70%	5.83%	0.61%	6.44%	\$27.71	\$430.43
ILU	Eucla Basin	Eucla	Resources	386 Mt	4.89%	2.63%	1.42%	4.04%	\$26.85	\$663.97
SFX	Dampier, WA	Thunderbird HG	Resources	1,040 Mt	12.20%	3.96%	0.93%	4.88%	\$22.63	\$463.18
SFX	Dampier, WA	Thunderbird	Reserves	681 Mt	11.27%	3.62%	0.87%	4.49%	\$21.09	\$469.49
MuZi ¹	Murray Basin	WIM150	Resources	1,650 Mt	3.72%	1.82%	0.77%	2.59%	\$18.85	\$728.43
ATR	Murray Basin	Donald	Resources	4,780 Mt	3.70%	2.22%	0.70%	2.92%	\$18.77	\$642.27
ILU	Sri Lanka	Sri Lanka	Resources	690 Mt	8.16%	5.90%	0.29%	6.19%	\$18.23	\$294.43
ILU	Eucla Basin	Ambrosia	Resources	149 Mt	2.23%	0.28%	1.11%	1.39%	\$18.01	\$1,296.37
ILU	Perth Basin	Perth Basin	Resources	1,041 Mt	5.49%	3.56%	0.60%	4.16%	\$17.69	\$425.29
MLM	Cape York	Urquart Point	Resources	3 Mt	5.94%	1.40%	0.61%	2.01%	\$17.06	\$847.03
Rele	Murray Basin	Magic	Resources	15 Mt	3.70%	2.89%	0.52%	3.40%	\$15.67	\$460.28
DRX	Eucla Basin	Cyclone	Reserves	138 Mt	2.60%	1.13%	0.72%	1.85%	\$15.63	\$844.63
BSE	Toliara, Madagascar	Ranobe	Resources	857 Mt	6.19%	4.55%	0.34%	4.89%	\$14.33	\$293.03
DRX	Eucla Basin	Cyclone	Resources	204 Mt	2.28%	1.10%	0.62%	1.71%	\$13.96	\$814.71
SFX	Dampier, WA	Thunderbird	Resources	3,230 Mt	6.91%	2.30%	0.57%	2.88%	\$13.84	\$481.17
BSE	Kenya	Kwale	Reserves	91 Mt	4.24%	3.03%	0.19%	3.22%	\$13.10	\$406.76
MuZi ¹	Murray Basin	Mindarie All	Resources	244 Mt	3.09%	1.80%	0.52%	2.32%	\$12.81	\$552.07
ILU	USA Atlantic	USA	Resources	118 Mt	4.43%	2.87%	0.49%	3.35%	\$12.56	\$374.38
MZI	Keysbrook, Perth Basin	Keysbrook	Resources	86 Mt	2.19%	1.80%	0.26%	2.06%	\$12.39	\$600.88
ILU	Sierra Leone	Sierra Leone	Resources	720 Mt	2.00%	1.16%	0.08%	1.24%	\$11.81	\$955.57
BSE	Kenya	Kwale	Resources	147 Mt	3.52%	2.47%	0.21%	2.68%	\$11.42	\$426.42
BPL	Murray Basin	Jaws	Resources	63 Mt	1.90%	1.18%	0.19%	1.37%	\$10.87	\$794.86
STA	Tanzania	Fungoni	Resources	22 Mt	2.82%	1.30%	0.47%	1.77%	\$10.55	\$594.74
SFX	Eneabba, WA	West Mine North	Resources	42 Mt	2.77%	2.10%	0.20%	2.30%	\$9.75	\$424.06
STA	Tanzania	Tajiri	Resources	147 Mt	3.10%	2.45%	0.12%	2.57%	\$8.38	\$325.83
SFX	Eneabba, WA	Eneabba All	Resources	345 Mt	2.19%	1.61%	0.26%	1.86%	\$8.24	\$441.93
BPL	Murray Basin	Gilligans	Resources	50 Mt	1.60%	0.88%	0.14%	1.02%	\$7.86	\$767.66
MZI	Keysbrook, Perth Basin	Yangedi	Resources	47 Mt	1.60%	1.27%	0.13%	1.40%	\$7.45	\$532.15
STA	Coburn	Coburn All	Reserves	308 Mt	1.20%	0.72%	0.28%	1.00%	\$6.33	\$635.95
MDL	Grande Cote, Senegal	Grande Cote	Resources	1,847 Mt	1.40%	1.08%	0.15%	1.23%	\$4.61	\$373.37
MDL	Grande Cote, Senegal	Grande Cote	Reserves	1,765 Mt	1.44%	1.06%	0.15%	1.20%	\$4.48	\$373.30
SFX	McCalls, WA	McCalls	Resources	3,650 Mt	1.36%	1.15%	0.06%	1.20%	\$3.43	\$284.74
MZI	Keysbrook, Perth Basin	Railway	Resources	14 Mt	2.20%	?	?	?	?	?
STA	Tanzania	Fungoni	Reserves	12 Mt	3.89%	?	?	?	?	?

1: Values based on the following USD prices per tonne: Zircon - \$1,500, Rutile \$1,000, High Ti leucoxene \$500, Low Ti Leucoxene \$400, Ilmenite \$183.

2: MuZi is Murray Zircon, now privately owned – this was previously Australian Zircon.

3: “?” indicates relevant HMS composition not publicly released

Source: IRESS, Company reports: Company reports

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