

# Market Update

26 February 2019

February 2019 – Highlights

**Cobalt Blue Holdings Limited**  
A Green Energy  
Exploration  
Company

ASX Code:

**COB**

#### Commodity Exposure:

**Cobalt & Sulphur**

#### Directors & Management:

**Robert Biancardi** Non-Exec Chairman  
**Hugh Keller** Non-Exec Director  
**Robert McDonald** Non-Exec Director  
**Joe Kaderavek** CEO & Exec Director  
**Robert Waring** Company Secretary

#### Capital Structure:

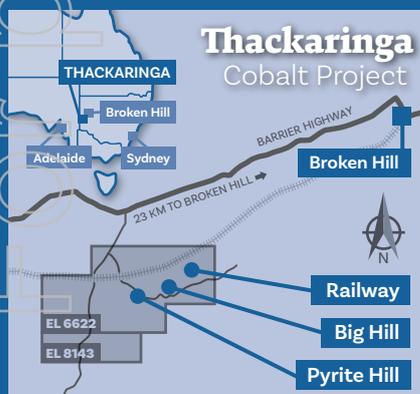
Ordinary Shares at 26/02/2019: **124.6m**

Options (ASX Code: COBO): **25.4m**

Market Cap (undiluted): **\$19.3m**

#### Share Price:

Share Price at 26/02/2019: **\$0.155**



#### Cobalt Blue Holdings Limited

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## Positive Large Scale Testwork Results

#### KEY POINTS:

- Large scale (45 tonne) testwork supports >90% cobalt recoveries (to concentrate).
- Processed 150 kilograms of concentrate through a thermal treatment circuit using a continuous pilot furnace. Results likely to be available by end Q2 2019.
- Resource upgrade due end March 2019.

#### Introduction

Since the publication of the Pre-Feasibility Study (PFS) completed in June 2018, Cobalt Blue Holdings (ASX:COB) has continued a series of metallurgical testwork programs. These include optimisation of process parameters along with scaling up testwork equipment to demonstration/commercial sized plant. A conceptual flow diagram is shown in Figure 1.

#### Test of concentration circuit using commercial-sized equipment

ALS Metallurgy Burnie was engaged to produce cobalt-pyrite concentrates from 45 tonnes (t) of ore samples (RC chips). The ore originated from the previous two drilling campaigns and had been preserved in cold storage. The ore was screened at 1180 microns, with oversize crushed to meet the upper particle size threshold. The samples were then passed over commercial-sized gravity spirals working in a rougher-cleaner sequence, with the tails then forwarded to flotation cells. The results from this program will be used by COB to optimise the 'concentrator circuit' process engineering design criteria. The quantity of concentrate is over 6t and this will be used for thermal decomposition (pyrolysis) trials.

A follow up program is expected later in 2019, as a further 40–50t of ore is currently being stored in Broken Hill (mixture of RC chips and diamond drill core).

Photos of the rougher spiral and cleaner spiral are shown in Figure 2. The material on the inside of the spiral is the heavy cobalt-pyrite concentrate, while lighter gangue (waste) particles migrate to the outside of the slurry path.

To date, 45t of ore samples have been gravity separated and final work is ongoing for recovery of sulphides from the gravity circuit tails. The gravity rougher concentrate was re-processed through a gravity cleaner circuit. The rougher tails were classified prior to scavenger flotation, whereas the cleaner tails were forwarded directly to flotation. Results from the flotation circuit are expected to be finalised in March 2019.

Figure 1. Conceptual flowchart for processing ore and production of cobalt sulphate

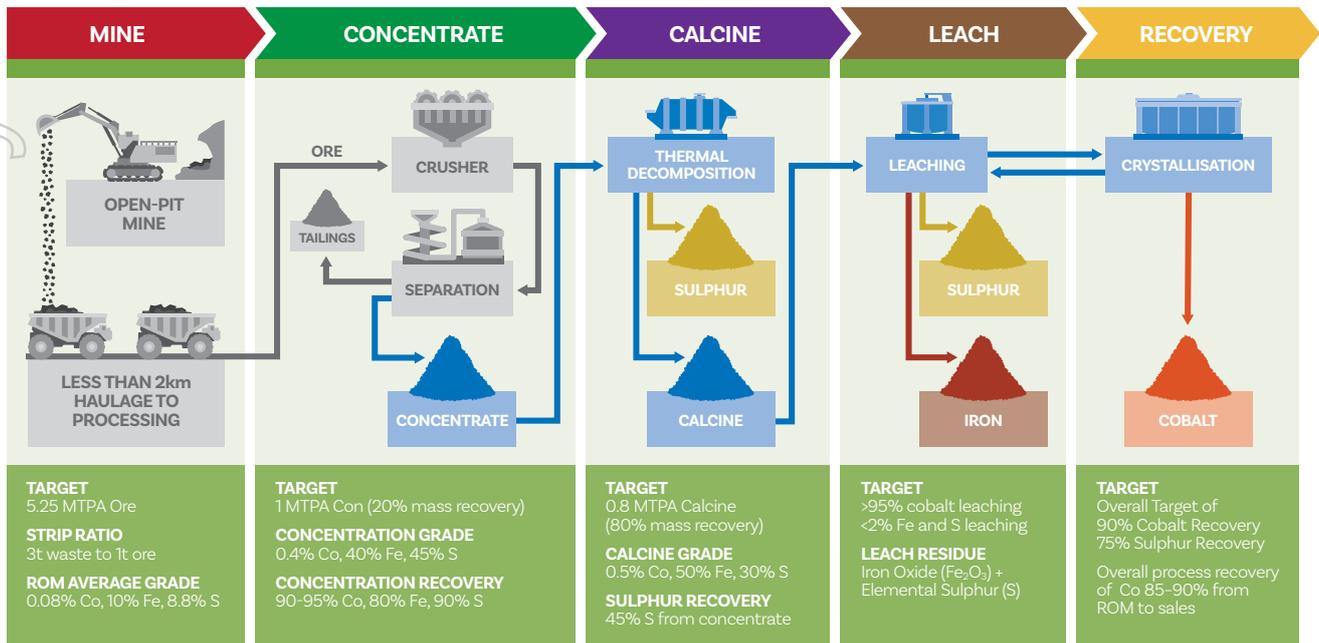


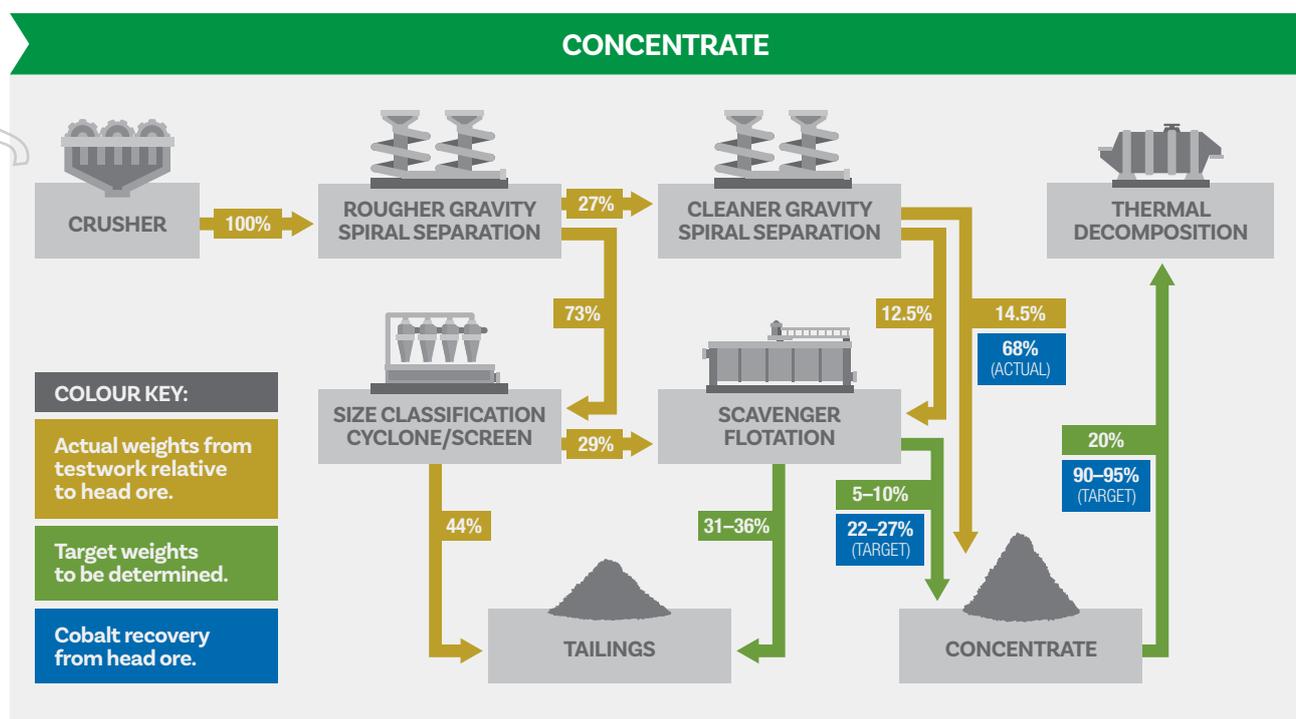
Figure 2. Operating rougher spiral (LHS) and cleaner spiral (RHS), with 'heavy' pyrite concentrate being separated from 'light' feldspar/silica gangue.



The weighted average recovery of cobalt from the entire 44.5t of ore to cleaner gravity concentrate was 68%, from a weighted average head ore grade of 1002 ppm. The concentrate cobalt grade averaged 4655 ppm, and the mass recovery was 14.5%. Recoveries from the scavenger float circuit will be released when available.

Figure 3 shows the weighted average mass and cobalt recoveries achieved through the spiral circuit, and the target recoveries in the flotation circuit.

Figure 3. Summary of concentrate circuit mass and cobalt recoveries (flotation recoveries to be confirmed)



The efficiency of the spirals to recover cobalt-pyrite was assessed by measuring the cobalt content of various size fractions from the rougher and cleaner tails. It is well known that gravity spirals are effective to ~75 microns, and the results in Table 1 indicate that the bulk trial gravity circuit was successful in recovering almost all of the cobalt-pyrite in the >75 micron fractions into the gravity cleaner concentrate. The remaining cobalt, in the rougher and cleaner tails, is in the <75 micron fraction, and this can be recovered by a scavenger flotation circuit. The data confirms that the gravity spirals are highly efficient, and that the cobalt recovery (in this trial 68%) from head ore to gravity concentrate is linked to ore particle size distribution. Crushing and milling of the ore is to be optimised in future work programs, with coarser particles sizes preferred to enhance cobalt recoveries on the gravity circuit and limit material flows to the flotation circuit.

Table 1. Cobalt and mass distribution per size fraction for subsamples from the gravity circuit

Size fraction	Rougher Tails		Cleaner Tails	
	Mass	Co grade	Mass	Co grade
>75um	60.2%	0.00%	58.5%	0.01%
38-75um	13.3%	0.02%	23.6%	0.18%
<38 um	26.5%	0.10%	17.9%	0.25%

COB is encouraged by these results, which add confidence that the target mass recovery to concentrate is ~ 20% and a target cobalt recovery from ore to concentrate of >90%. These are in line with key results obtained in the PFS. The ability to upgrade the ore to a concentrate (and discard ~80% of the mass as tailings) significantly differentiates the Thackaringa Project from laterite projects, which generally need to treat “whole-of-ore” through a high pressure acid leaching plant.

### Thermal decomposition testwork continues

Harper International (USA) were engaged to test the thermal treatment process for cobalt-pyrite concentrate using a continuous rotary furnace. The throughputs were approximately 4-8kg/hr, and the total program treated ~150kg of feed. The pilot furnace had a diameter of ~15cm (6 in). The program represents a confirmation step of the smaller scale PFS testwork which was conducted in batch mode using 2kg charges. The resulting calcine will be retained for further cobalt sulphate testwork at ALS (an extension of the program described below), while the elemental sulphur will be retained for prilling, handling, logistics, and marketing studies. COB has engaged Enersul (Canada) to assist with elemental sulphur prilling studies.

Once the full data set of assays and mineralogical studies have been completed, further large-scale testing of the ‘thermal-treatment circuit’ will be planned for 2019.

Figure 4. Left photo shows actual elemental sulphur collected in condenser unit during thermal treatment of pyrite concentrate using a continuous pilot-scale furnace. Typical Enersul product is shown in right photo (photo taken during a site visit by COB to an Enersul plant in Alberta Canada).



### Optimisation of cobalt sulphate production process – purification of heavy metal impurities

ALS Metallurgy Perth have been engaged to study trace metal purification from the leach liquors, prior to cobalt sulphate crystallisation. Their work has included upscaling leaching tests from 1kg to 3kg batches in 15L autoclaves (total of 20kg of feed material leached). This has been followed by detailed optimisation of parameters for removing iron, copper, zinc, manganese and nickel from the leach liquors. The techniques include precipitation, ion-exchange, and solvent extraction (as previously developed in the PFS). The program will conclude with production of cobalt sulphate. The results of this program will then be used by COB to design a larger bulk sample test program.

### Waste rock and process plant tailings characterisation

Samples of waste rock and process plant tailings have been sent to Bureau Veritas Metallurgy (Adelaide) for characterisation of acid formation properties. The work builds on the initial ~100 samples tested in the PFS, with the total number of samples expected to be ~250 by the end of 2019. The quantity and precise selection of samples will enable COB to properly model potentially acid forming and non-acid forming blocks within the mining pit shells. This is crucial to optimising the mining schedules, waste rock management strategies, and long-term rehabilitation outcomes for the site.

Similarly, ATC Williams have been engaged to refine waste rock and tailings storage management strategies. In addition to preliminary engineering designs and costings estimates, the program includes testwork on rheology, compaction, shrinkage, permeability, thickening, handling, and settling of process plant tailings. Blending tailings and waste rock will also be evaluated, as this can provide superior long-term environmental outcomes.

### Further announcements

Parallel to metallurgical and processing studies, COB is undertaking a resource upgrade for the project. This upgrade is due end March 2019.

As results are finalised on each of these metallurgical work programs, COB will release further updates to the market. A summary of the work programs is presented in Table 2.

Table 2. Key metallurgical work program summary

	Concentrate Circuit		Pyrolysis Circuit		Leaching/Purification	
<b>Scoping Study</b>	20–30kg	Lab scale	1kg	Lab scale	1kg	Lab scale
<b>Pre-Feasibility Study</b>	820kg	Single bulk trial in batch mode	100kg	2–3kg batch mode	30kg	0.2–1kg batches
<b>Current Work to date</b>	45t	Pilot circuit in continuous mode at 2–3t/hr	150kg	Pilot circuit in continuous mode at 4–8kg/hr	20kg	1–3kg batches
<b>Planned Work</b>	45–50t	Pilot circuit	Up to 10t	Small commercially-available furnace	Up to 10t	Pilot equipment

## Cobalt Blue Background

Cobalt Blue Holdings Limited (ASX:COB) is an exploration and project development company focussed on green energy technology. Work programs are advancing to enable an upgrade of the Mineral Resource at the Thackaringa Cobalt Project in New South Wales to include Measured Resources.

Cobalt is a strategic metal in strong demand for new generation batteries, particularly lithium-ion batteries now being widely used in clean energy systems.

Potential to extend the Mineral Resource at Pyrite Hill, Big Hill, Railway and the other prospects is high. Numerous other prospects within COB's tenement package are at an early stage and under-explored.

Looking forward, we would like our shareholders to keep in touch with COB updates and related news items, which we will post on our website, the ASX announcements platform, as well as social media such as Facebook (f) and LinkedIn (in). Please don't hesitate to join the 'COB friends' on social media and to join our newsletter mailing list at our website.



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## Previously Released Information

This ASX announcement refers to information extracted from the following reports, which are available for viewing on COB's website <http://www.cobaltblueholdings.com>

- 5 February 2019: Drilling Campaign Update
- 16 January 2019: Drilling Campaign Paused. Technical Work Programs Continue
- 05 December 2018: Thackaringa Cobalt Project Drilling and Water Supply Update
- 01 November 2018: Thackaringa Feasibility Study Drilling Campaign Commences
- 13 September 2018: Bankable Feasibility Study Commences with Drilling Campaign and Project Optimisation Studies
- 04 July 2018: Thackaringa Pre Feasibility Study Announced
- 20 April 2018: Thackaringa JV – Stage One Completed
- 19 March 2018: Thackaringa – Significant Mineral Resource Upgrade
- 05 March 2018: PFS – Calcine and Leach Testwork Complete – Strong Results
- 24 January 2018: Significant Thackaringa Drilling Program complete – Resource Upgrade pending

## Competent Person's Statement – Metallurgy

The information in this report that relates to Metallurgical Testwork Results or Engineering Design Studies is based on, and fairly represents, information and supporting documentation prepared by Dr Andrew Tong, a Competent Person who is a Member of The Australasian Institute of Mining and Metallurgy. Dr Andrew Tong is engaged by Cobalt Blue Holdings as Executive Manager.

Dr Andrew Tong has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Dr Andrew Tong consents to the inclusion in the report of the matters based on his information in the form and context in which they appear.