

28 July 2020

## HAVILAH'S CRITICAL MINERALS

**Havilah Resources Limited (Havilah)** is pleased to release a presentation to be given by Havilah's Technical Director, Dr Chris Giles, at a Government of South Australia, Department for Trade and Investment sponsored webinar later today. Details are provided below and on the following link: <https://dti.sa.gov.au/investment/opportunities-for-industry/energy-mining>

The webinar is addressing how South Australia is meeting global demand for responsibly sourced future minerals.

Havilah's presentation outlines the critical minerals potential of Havilah's extensive Curnamona Craton tenement holdings. Rare earth elements (REE), cobalt and tungsten are closely associated with the widespread stratabound copper-gold mineralisation discovered by Havilah in the region. For example, Havilah's total JORC cobalt resources are 43,400 tonnes contained in cobalt-bearing pyrite in the [Kalkaroo copper-gold](#) and [Mutooroo copper-cobalt](#) deposits. A research agreement with the University of South Australia is investigating the feasibility of recovering a [REE mineral concentrate](#) from saprolite gold ore in the Kalkaroo oxidised gold cap ore zone.



WEBINARS

Responsibly sourced minerals

Terry Burgess, Member of the Minerals and Energy Advisory Council  
Dr Chris Giles, Technical Director, Havilah Resources  
David Christensen, Managing Director, Renascor Resources



## How South Australia is meeting global demand for responsibly sourced minerals

Terry Burgess, Member of the Minerals and Energy Advisory Council

Dr Chris Giles, Technical Director, Havilah Resources

David Christensen, Managing Director, Renascor Resources



**Adelaide: Tues 28 July 10:00am (ACST)**

[View webinar in your time zone](#)



The importance of future minerals has escalated in recent years due to high technology applications, including electric vehicles and renewable energy. South Australia has significant global and national resources of future minerals including graphite (65 per cent of Australia's resources) and zircon including the world's largest zircon mine, Jacinth-Ambrosia, as well as cobalt, rare-earth elements and magnesium, manganese and gallium. South Australia's Lot Fourteen and Tonsley innovation precincts, state university future minerals leadership, and Geological Survey of South Australia offer South Australia advanced thinking and potential in the development of technology and processing. There are increasing opportunities to grow a sustainable supply-chain that leverages the state's natural resource endowment and research innovation, to become a global leader in the processing and export of these vital minerals.

This release has been authorised on behalf of the Havilah Resources Board by Mr Simon Gray.

For further information visit [www.havilah-resources.com.au](http://www.havilah-resources.com.au)

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# Havilah Resources

**Critical Minerals in Low Sovereign Risk South Australia**

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**REE, Cobalt and Tungsten are associated with copper-gold mineralisation in the Curnamona Craton**

**Potential Rare Earth and Cobalt Production as a By-product of Copper-Gold Mining**

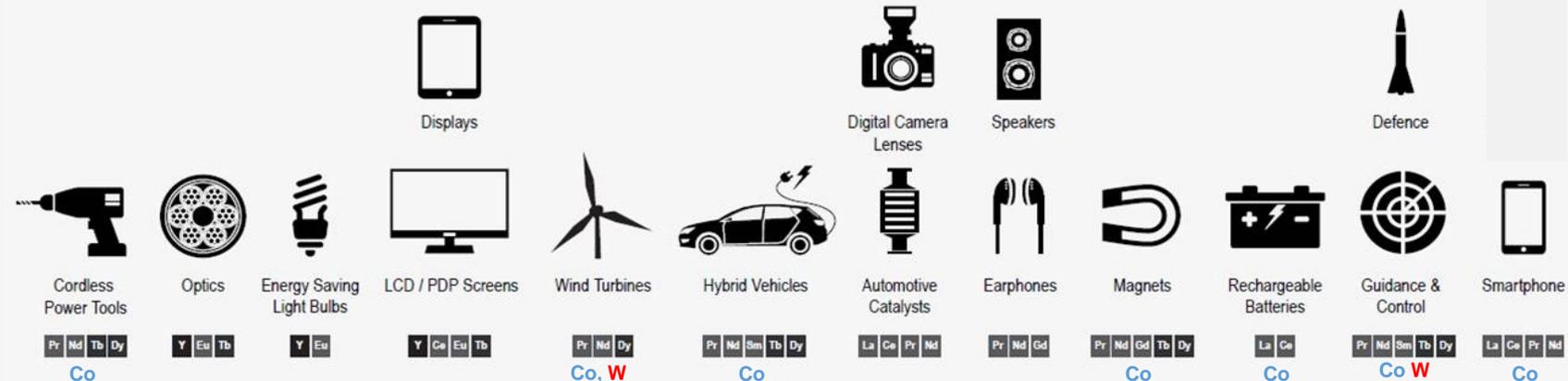
# REE, Cobalt and Tungsten – Strategic and Critical

- REE, Co and W are not scarce, but economic concentrations are geologically restricted and uncommon.
- In each case production is dominated by a single country.
- [China dominates](#) global primary REE (68%) and secondary REE (nearly 100%) production (in 2018) and for W has historically influenced mining economics by controlling raw W available on world markets.
- The Democratic Republic of Congo produced almost two thirds of the world's Co during 2019.
- Western nations are urgently seeking to secure their own strategic supplies, prompting the Australian Government's [Critical Minerals Strategy](#) with the stated goal to *“create the conditions needed .....to bring new critical minerals projects into production”*.
- Permanent magnets and catalysts are the largest users of REE, most notably for neodymium (Nd), praseodymium (Pd), dysprosium (Dy) and terbium (Tb) which are the higher value REE.
- Cobalt is a vital component of many lithium battery cathodes and is also used in permanent magnets (with REE), specialised super alloys (eg turbine blades), catalysts and historically as a pigment.
- Tungsten is mainly used in the production of hard materials based on tungsten carbide and also in high strength, high temperature alloys frequently used in military applications.
- Electric vehicles use up to 1 kg of REE and 4-30 kg of cobalt depending on motor and battery type.

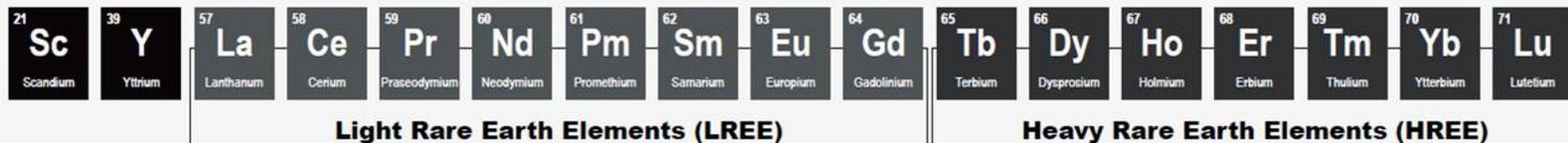
# REE, Co & W – A Wide Variety of Modern Age Uses

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“In just a period of decades, rare earth elements have seeped deeply into the fabric of modern technology and industry and have proven exceptionally challenging to duplicate or replace.” [Global Rare Earth Industry Association](#)



## CLASSIFICATION



# Low Sovereign Risk - Mining Friendly South Australia

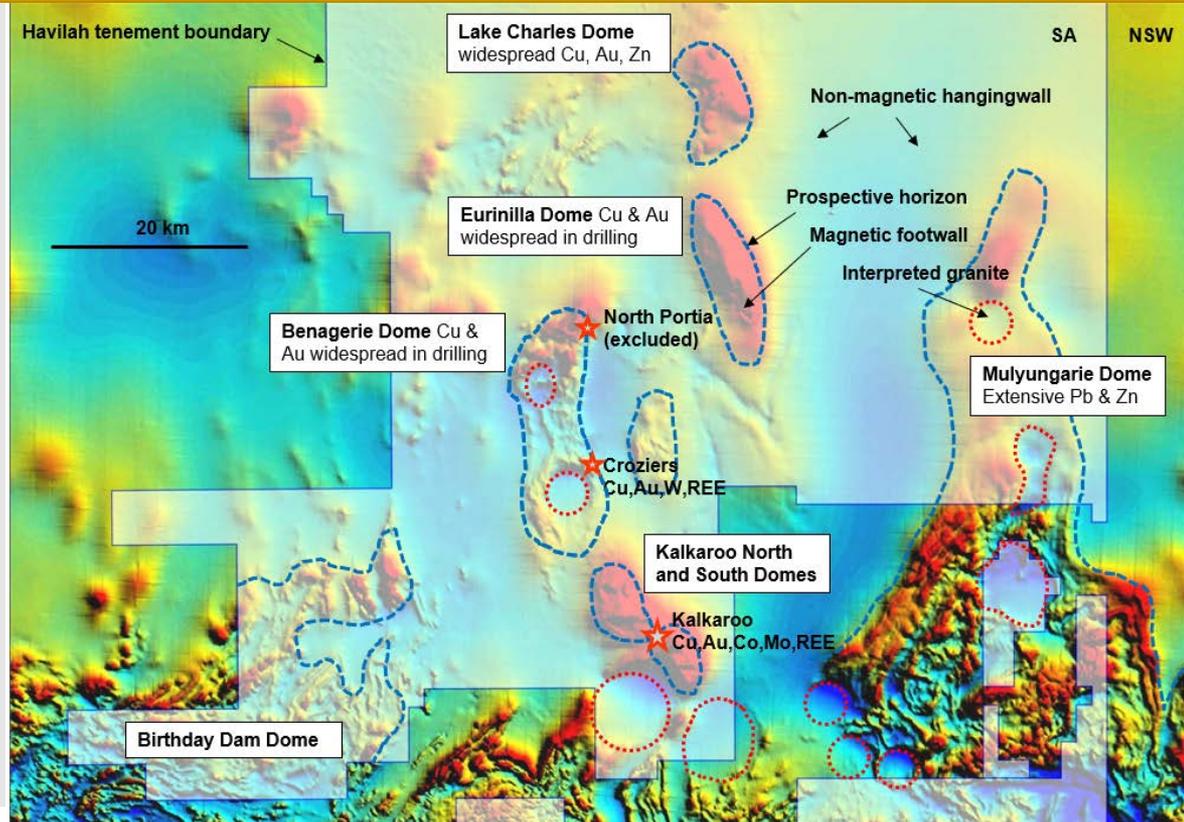
## An Ethical, Non-Conflict and Secure Source of Critical Minerals

- ✓ **Conflict-free, strategic and critical minerals** – Rare earth element (**REE**) and tungsten (**W**) potential, in association with existing JORC Mineral Resources for copper, gold and cobalt (**Co**).
- ✓ **Low sovereign risk jurisdiction** – with a mining friendly government in South Australia that actively encourages mineral development.
- ✓ **Favourable logistics and infrastructure** – near regional mining centre of Broken Hill with its skilled workforce; the main east-west railway line and highway runs through tenement block; Havilah owns 550 km<sup>2</sup> Kalkaroo Station pastoral lease.
- ✓ **Exploration upside** – >16,000 km<sup>2</sup> tenement coverage of the Curnamona Copper Belt and the Mutooroo Copper-Cobalt District in the Curnamona Craton.
- ✓ **Experienced technical team** – Havilah's technical team has an exceptional track record of exploration success (including discovery of 8 JORC Mineral Resources) and has developed and operated the Portia gold mine. Havilah operates its own drilling crew, which is key to its successful exploration history.



# Curnamona Craton – a New REE, Co & W Province

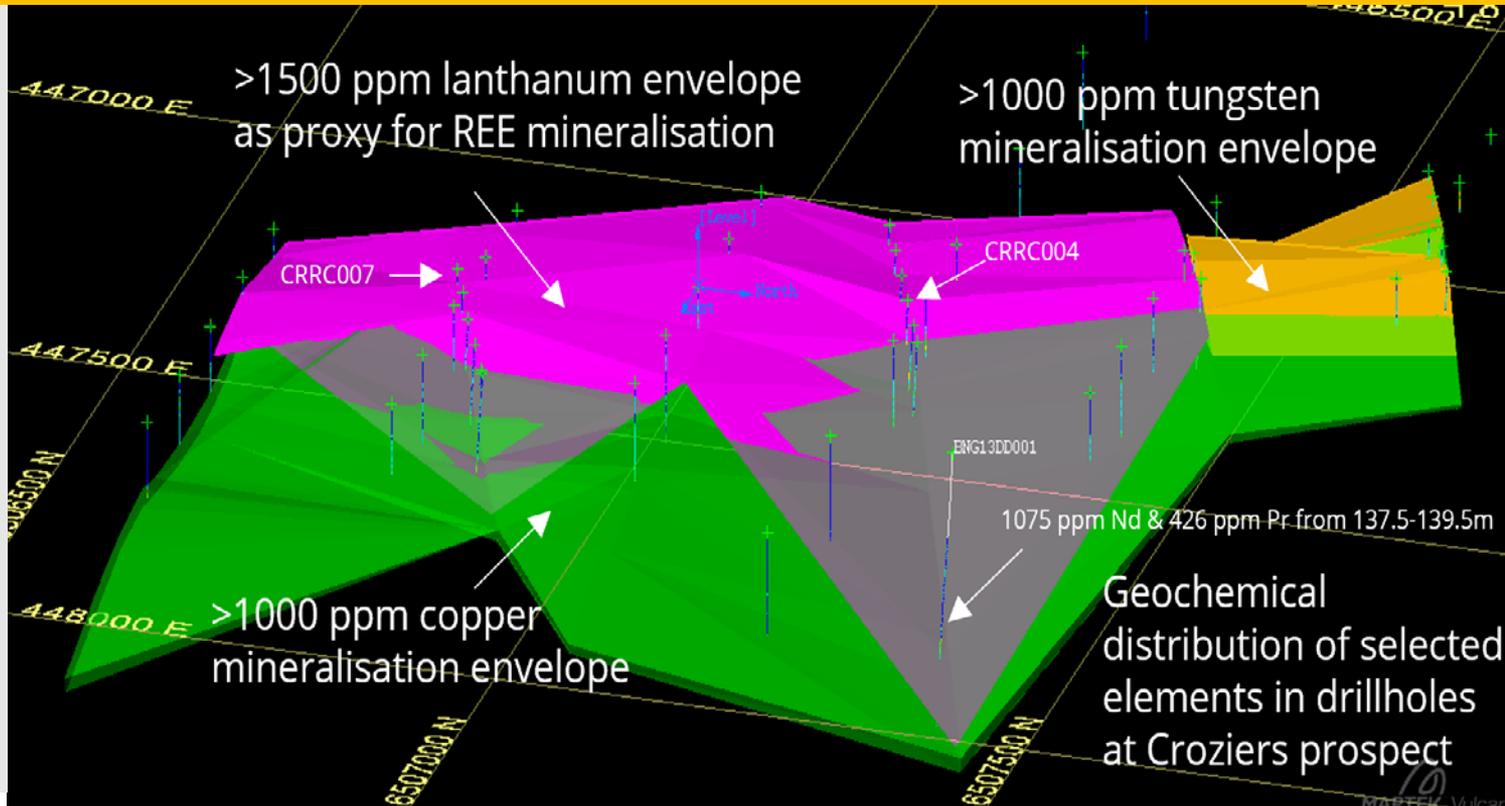
- Elevated REE and W are frequently associated with Havilah's stratabound copper-gold-cobalt mineralised prospects in five separate structural domes in the Curnamona Copper Belt.
- Emeritus Professor Ken Collerson, a world expert on the geology of REE deposits, considers *"the geochemical evidence clearly shows that the prospectivity of the area is very high for alkaline generated REE-copper-gold-cobalt-nickel-platinum group element systems.....This provides a compelling scientific case for concerted REE exploration in the Curnamona Craton"* ([ASX release 19 February 2020](#)).
- Co is widespread in cobalt-bearing pyrite in both the stratabound Curnamona Copper Belt copper-gold mineralisation and in the Mutooroo Copper-Cobalt District shear controlled copper-cobalt lodes.



# REE & W in Croziers Copper Prospect

- Results for a single drillhole (BNG13DD001) at the Croziers copper prospect show elevated levels of the higher value REE ([ASX release 7 January 2020](#)).

- Using the light-REE lanthanum as a proxy for these elements there is a broad REE mineralisation envelope at Croziers (pink and grey). This envelope partially overlaps a copper mineralised envelope (green) and abuts a tungsten mineralised zone (yellow).



# Critical Minerals in Havilah's Advanced Projects

## Kalkaroo Copper-Gold-Cobalt Project (REE potential)

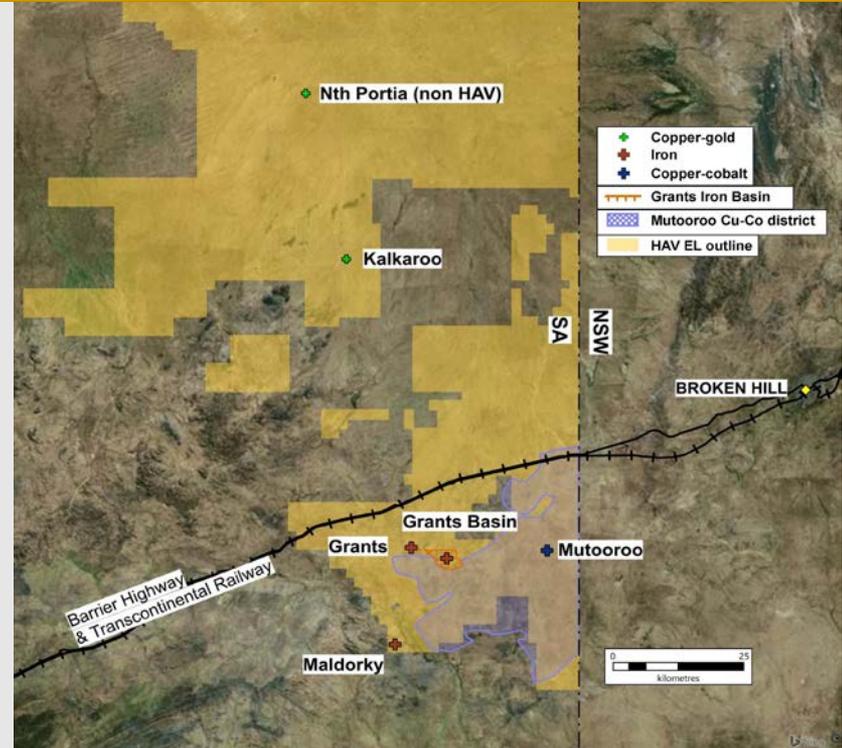
- Positive independent prefeasibility study confirms Kalkaroo as the largest undeveloped open pit copper deposit in Australia based on a CuEq 100 Mt Ore Reserve (90% Proved) ([havilah-resources-projects.com/kalkaroo](http://havilah-resources-projects.com/kalkaroo) and [ASX release 18 June 2019](#)).
- JORC Resources: 1.1Mt copper, 3.1 Moz gold, 23.2 Kt cobalt.
- Planned average annual production of 30,000 t copper and 72,000 oz gold over a 13 year production period.
- Potential for by-product REE and Co concentrate production.

## Mutooroo Copper-Cobalt-Gold Project

- Comparatively high grade open pit and underground copper deposit (1.53% Cu) with appreciable cobalt.
- JORC Mineral Resources: 195 Kt copper, 20.2 Kt cobalt and 82.1 Koz gold ([havilah-resources-projects.com/mutooroo](http://havilah-resources-projects.com/mutooroo)).

## Total Havilah cobalt resources: 43,400 tonnes

- In both deposits cobalt occurs in cobalt-bearing pyrite that can be recovered during the copper concentration process.



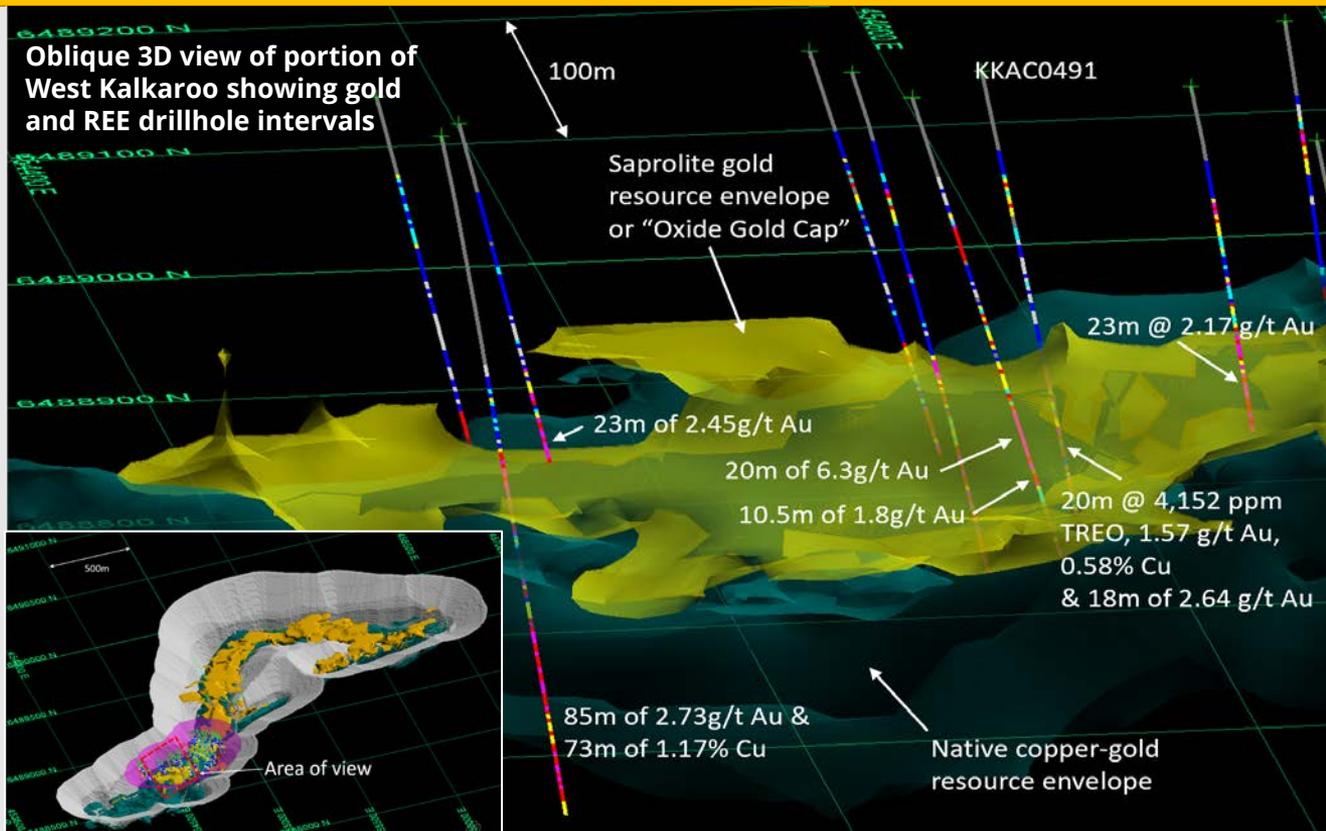
**Total Havilah JORC Mineral Resources: Copper 1.3 Mt**

**Gold 3.2 Moz**

**Cobalt 43.4 Kt**

# REE & Co Associated With Kalkaroo Copper-Gold Deposit

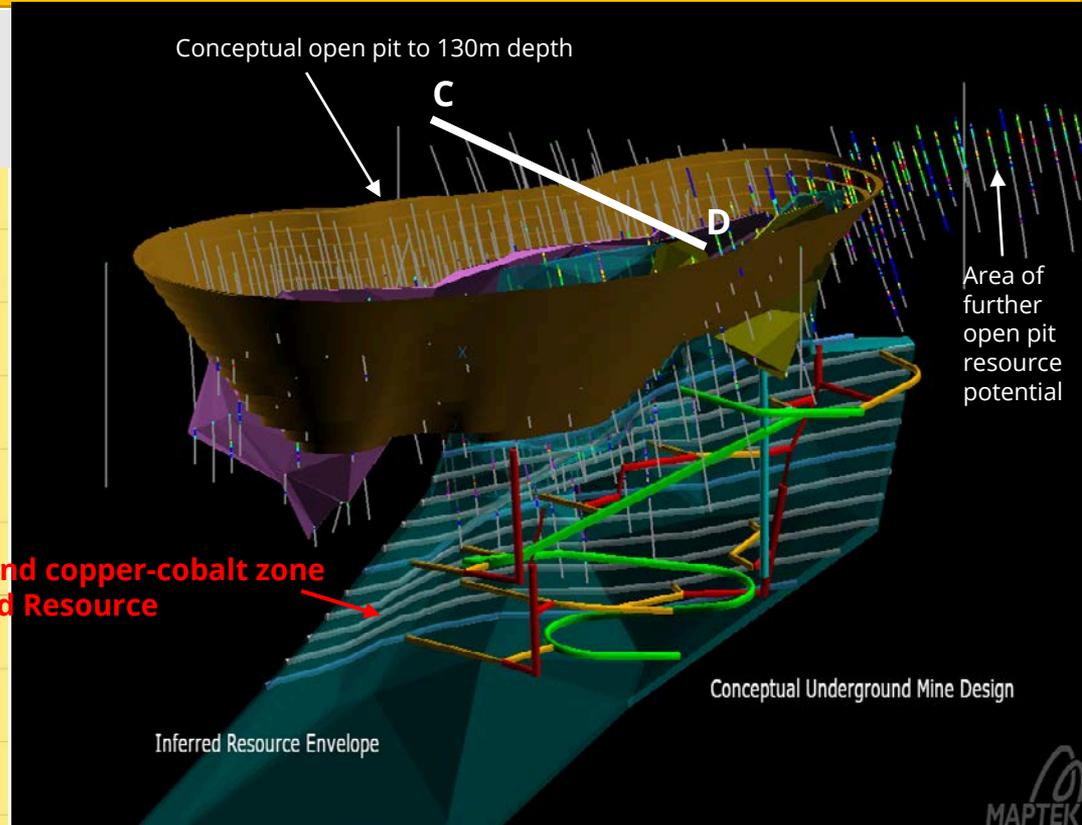
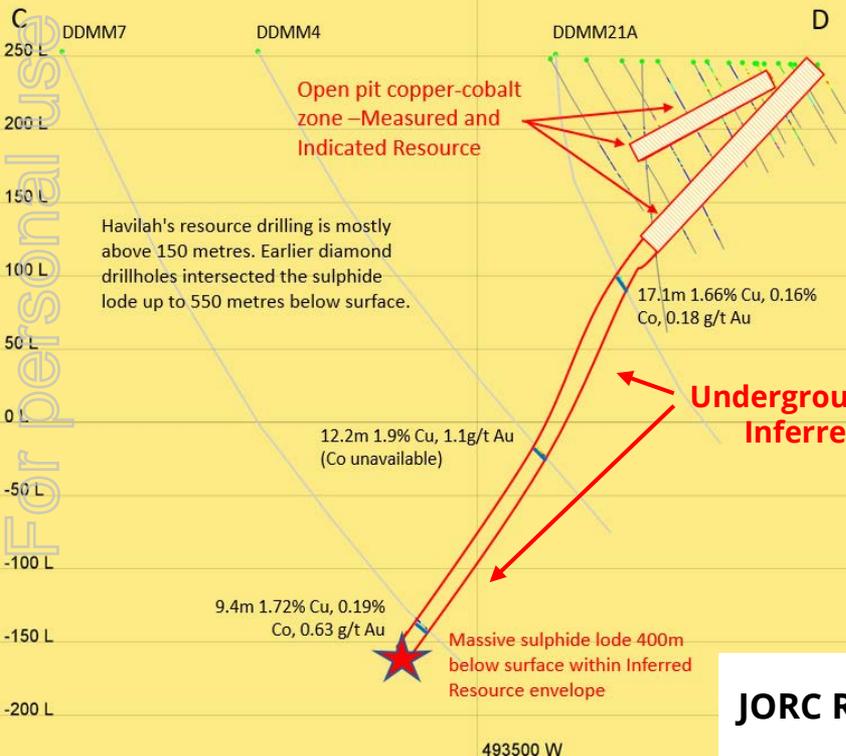
- Recent drilling has identified highly elevated REE at West Kalkaroo, for example drillhole KKAC0491: 20 metres of 4,152 ppm TREO\*, 1.57 g/t gold and 0.58% copper from 62-82 metres ([ASX release 23 April 2020](#)).
- This included 10 metres of 6,746 ppm TREO from 62 to 72 metres, with the higher value REE, namely **Dy+Nd+Pr+Tb**, comprising 29% of the TREO.
- Closely associated with ore-grade copper-gold mineralisation at West Kalkaroo, where a gold-only start up open pit is planned (pink outline in inset image) within the overall final Kalkaroo open pit design (grey outline in inset image).
- Potential for by-product REE production is presently being evaluated under an Accelerated Discovery Initiative ([ASX release 26 June 2020](#)) and research agreement with the University of South Australia ([ASX release 1 June 2020](#)).



\*Total rare earth oxides (TREO) is the industry standard and accepted norm for reporting REE and is based on the sum of the estimated grades for the following 15 rare earth oxides: La<sub>2</sub>O<sub>3</sub>, Ce<sub>2</sub>O<sub>3</sub>, Pr<sub>6</sub>O<sub>11</sub>, Nd<sub>2</sub>O<sub>3</sub>, Sm<sub>2</sub>O<sub>3</sub>, Eu<sub>2</sub>O<sub>3</sub>, Gd<sub>2</sub>O<sub>3</sub>, Tb<sub>4</sub>O<sub>7</sub>, Dy<sub>2</sub>O<sub>3</sub>, Ho<sub>2</sub>O<sub>3</sub>, Er<sub>2</sub>O<sub>3</sub>, Tm<sub>2</sub>O<sub>3</sub>, Yb<sub>2</sub>O<sub>3</sub> and Y<sub>2</sub>O<sub>3</sub>. Refer to Appendix 1 in [ASX release 23 April 2020](#) for details. Note 1 ppm (part per million) = 1 g/t.

# Mutooroo Copper-Cobalt Project

Concept is for an initial shallow open pit exploiting >1.3% Cu and 0.14% Co Measured and Indicated resources followed by underground mining of higher grade Inferred resources >1.7% Cu and 0.17% Co (refer to JORC resource table at end).



JORC Resources:

Copper 195.0 Kt

Cobalt 20.2 Kt

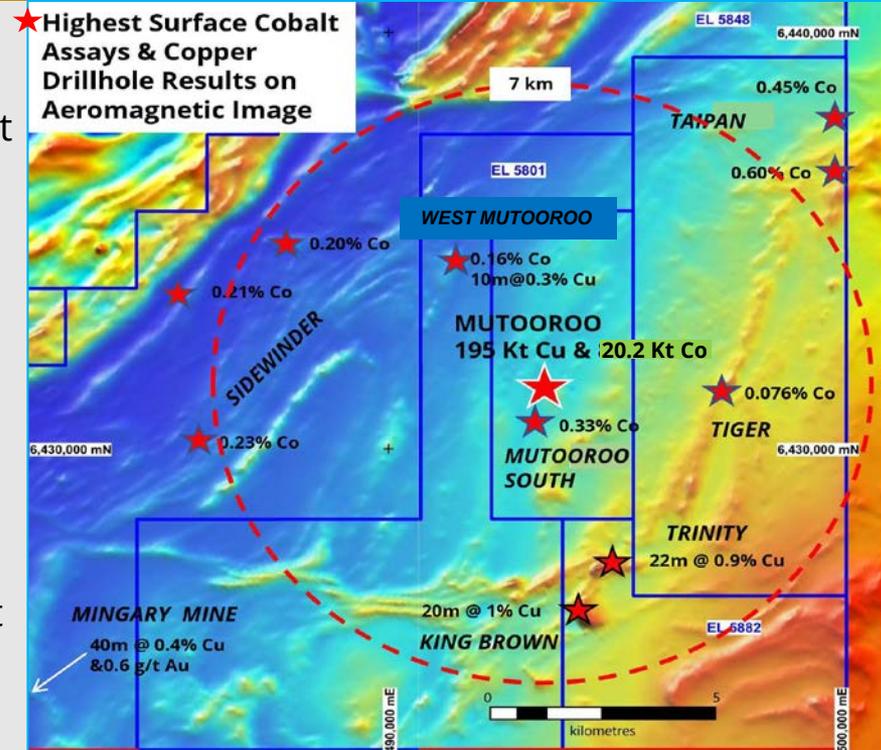
Gold 82.1 Koz



# High Co Prospectivity in the Mutooroo Region

## Many under-explored high conviction prospects

- Mutooroo lies within a very prospective copper-cobalt district that has high discovery potential.
- Within 10 km of Mutooroo are numerous prospects dating from the 1960's with potentially ore-grade copper drilling intersections, but never subsequently assayed for cobalt and gold nor followed up with drilling (West Mutooroo, King Brown and Trinity).
- Widespread high copper and cobalt results in Havilah's surface geochemical sampling have defined a large target area called Sidewinder. Peak cobalt grades are at economic levels (eg 0.20%-0.60% cobalt at several prospects). Associated highly anomalous copper (ASX release 7 December 2018).



High discovery potential for additional Co resources by drilling nearby prospects

# Havilah's Future Critical Minerals Strategy

- Critical minerals associated with stratabound copper-gold-cobalt mineralisation and copper-cobalt sulphide lodes in the Curnamona Craton hold potential for production of REE, Co and W as by-products of copper-gold mining operations.
- Emeritus Professor Ken Collerson observed that because the REE (and Co) may be recovered as a by-product of the copper-gold concentration process at Kalkaroo *"This could potentially provide an economic advantage for the Kalkaroo project, compared to those projects that are solely REE based."* He further notes that *"Kalkaroo is advantaged in having the highest proportion of the more valuable heavy-REEs."* ([ASX release 19 February 2020](#)).
- Since the REE, Co and W are by-products, the project economics do not depend on their production alone. This means that their production could continue even in periods of low prices, which is vital for critical minerals where continuity of supply is paramount.
- Havilah's current research agreement with the University of South Australia aims to establish the key metallurgical parameters for a processing flow sheet that can recover REE minerals during the copper concentration process. The objective is to recover a high purity REE mineral concentrate for sale to new Western processing facilities. Recovery of cobalt-bearing pyrite by flotation is well established technology.
- The value upside for Havilah is that if REE, Co and W can be economically recovered in mineral concentrates as by-products of the normal copper concentration processes they will potentially provide additional revenue streams for Havilah's mining projects.
- Havilah is working towards early commencement of a gold-only start up open pit at West Kalkaroo, based on a granted ML, ownership of the land and advanced mining studies. This could result in early production of REE concentrates subject to the recovery studies currently in progress.
- For more information on Havilah's REE strategy click the following link: <https://www.havilah-resources-projects.com/rareearthelements>

# Cautionary and Competent Person's Statements

## Cautionary Statement

The information contained in this presentation is not financial product advice. The presentation is for information purposes and is of a general and summary nature only. Neither Havilah Resources Limited (Havilah) nor any member of the Havilah Group of companies, gives no warranties in relation to the statements and information in this presentation. Investors should seek appropriate advice on their own objectives, financial situation and needs.

It is not recommended that any person makes any investment decision in relation to Havilah based on this presentation. This presentation should be read in conjunction with the latest Annual Report together with any announcements made by Havilah in accordance with its continuous disclosure obligations arising under the *Corporations Act 2001*.

This presentation contains certain statements which may constitute 'forward-looking statements'. Such statements are only predictions and are subject to inherent risks and uncertainties which could cause actual values, performance or achievements to differ materially from those expressed, implied or projected in any forward-looking statements. Havilah disclaims any intent or obligation to update publicly any forward-looking statements, whether as a result of new information, future events or results or otherwise. Investors are cautioned that forward-looking statements are not guarantees of future performance and investors are cautioned not to put undue reliance on forward-looking statements due to the inherent uncertainty therein.

## Competent Person's Statement

The information in this presentation that relates to Exploration Targets, Exploration Results, Mineral Resources and Ore Reserves is based on data compiled by geologist, Dr Chris Giles, a Competent Person who is a member of The Australian Institute of Geoscientists. Dr Giles is Technical Director of the Company, a full-time employee and is a substantial shareholder. Dr Giles has sufficient experience, which is relevant to the style of mineralisation and type of deposit and activities described herein to qualify as a Competent Person as defined in the 2012 Edition of *'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'*. Dr Giles consents to the inclusion in the presentation of the matters based on his information in the form and context in which it appears.

Information for the Kalkaroo Ore Reserve & Mineral Resource and the Mutooroo Inferred cobalt & gold Mineral Resources complies with the JORC Code 2012. All other information was prepared and first disclosed under the JORC Code 2004 and is presented on the basis that the information has not materially changed since it was last reported. Havilah confirms that all material assumptions and technical parameters underpinning the reserves and resources continue to apply and have not materially changed. Except where explicitly stated, this presentation contains references to prior exploration results and JORC Mineral Resources, all of which have been cross-referenced to previous ASX announcements made by Havilah. The Company confirms that it is not aware of any new information or data that materially affects the information included in the relevant ASX announcements.

# JORC Ore Reserve and Mineral Resources

## JORC Ore Reserves

Project	Classification	Tonnes (Mt)	Copper %	Gold g/t	Copper tonnes (Kt)	Gold ounces (Koz)
Kalkaroo <sup>1</sup>	Proved	90.2	0.48	0.44	430	1,282
	Probable	9.9	0.45	0.39	44	125
<b>Total</b>		<b>100.1</b>	<b>0.47</b>	<b>0.44</b>	<b>474</b>	<b>1,407</b>

## Footnotes to the JORC Ore Reserve and Mineral Resource Tables

Numbers in tables are rounded

<sup>1</sup> Details released to ASX: [18 June 2018](#) (Kalkaroo)

<sup>2</sup> Details released to ASX: [18 October 2010](#) and [5 June 2020](#) (Mutooro)

<sup>3</sup> Details released to ASX [30 January 2018](#) and [7 March 2018](#) (Kalkaroo)

<sup>4</sup> Note that the Kalkaroo cobalt Inferred resource is not added to the total tonnage

## JORC Mineral Resources

Project	Classification	Resource Category	Tonnes	Copper %	Cobalt %	Gold g/t	Copper tonnes	Cobalt tonnes	Gold ounces
Mutooro <sup>2</sup>	Measured	Oxide	598,000	0.56	0.04	0.08			
	<b>Total</b>	<b>Oxide</b>	<b>598,000</b>	<b>0.56</b>	<b>0.04</b>	<b>0.08</b>	<b>3,300</b>	<b>200</b>	<b>1,500</b>
	Measured	Sulphide							
		Copper-Cobalt-Gold	4,149,000	1.23	0.14	0.18			
	Indicated	Sulphide							
	Copper-Cobalt-Gold	1,697,000	1.52	0.14	0.35				
Inferred	Sulphide								
	Copper-Cobalt-Gold	6,683,000	1.71	0.17	0.17				
<b>Total</b>	<b>Sulphide</b>	<b>Copper-Cobalt-Gold</b>	<b>12,529,000</b>	<b>1.53</b>	<b>0.16</b>	<b>0.20</b>	<b>191,700</b>	<b>20,000</b>	<b>80,600</b>
	<b>Total</b>	<b>Mutooro</b>	<b>13,127,000</b>				<b>195,000</b>	<b>20,200</b>	<b>82,100</b>
Kalkaroo <sup>3</sup>	Measured	Oxide Gold Cap	12,000,000			0.82			
	Indicated	Oxide Gold Cap	6,970,000			0.62			
	Inferred	Oxide Gold Cap	2,710,000			0.68			
	<b>Total</b>	<b>Oxide Gold Cap</b>	<b>21,680,000</b>			<b>0.74</b>			<b>514,500</b>
	Measured	Sulphide							
		Copper-Gold	85,600,000	0.57		0.42			
	Indicated	Sulphide							
		Copper-Gold	27,900,000	0.49		0.36			
	Inferred	Sulphide							
		Copper-Gold	110,300,000	0.43		0.32			
<b>Total</b>	<b>Sulphide</b>	<b>Copper-Gold</b>	<b>223,800,000</b>	<b>0.49</b>		<b>0.36</b>	<b>1,096,600</b>		<b>2,590,300</b>
	<b>Total</b>	<b>Kalkaroo</b>	<b>245,480,000</b>				<b>1,096,600</b>		<b>3,104,800</b>
Inferred	Cobalt Sulphide <sup>4</sup>	193,000,000		0.012				23,200	
<b>Total All Projects</b>		<b>All Categories (rounded)</b>	<b>258,607,000</b>				<b>1,291,600</b>	<b>43,400</b>	<b>3,186,900</b>



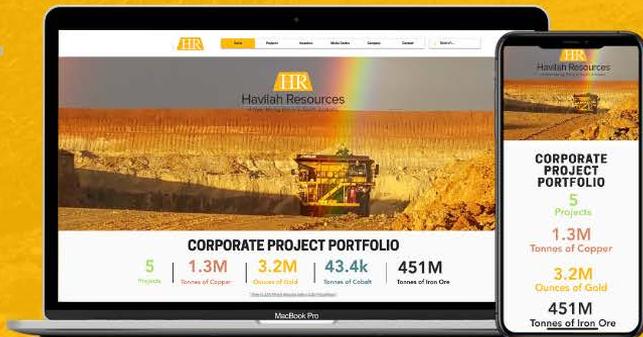
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