

1 June 2020

## REE COLLABORATIVE RESEARCH PROJECT WITH UNIVERSITY OF SOUTH AUSTRALIA

### HIGHLIGHTS

- A collaborative research agreement with the University of South Australia (**UniSA**) will investigate recovery of by-product rare earth elements (**REE**) from Havilah's West Kalkaroo saprolite gold ore.
- Specialised expertise, with relevant experience in recovery of REE by flotation, is available to carry out the experimental work at a well equipped metallurgical research laboratory in South Australia.
- A successful research outcome could potentially see a new supply of the strategic and critical minerals REE as a by-product of long-term copper-gold mining in northeastern South Australia.

**Havilah Resources Limited (Havilah or Company)** is pleased to announce that it has entered into an initial six month collaborative research agreement with the University of South Australia (**UniSA**) relating to recovery of REE from Havilah's Kalkaroo saprolite gold ore. Test sample material will come from Havilah's recent shallow drillholes at West Kalkaroo, which have encountered highly elevated levels of REE ([refer to ASX announcement of 23 April 2020](#)) in association with economic grades of gold and native copper mineralisation.

The objectives are to identify the minerals hosting the REE and to determine whether it is feasible to produce a REE concentrate using specialised flotation techniques suited to the extremely fine, clayey and oxidised nature of the saprolite material. This is to be achieved within the context of a processing circuit that is primarily designed to maximise gold recoveries.

UniSA is well positioned to assist Havilah in this via its well equipped metallurgical research laboratory at the Future Industries Institute on the Mawson Lakes campus in South Australia. The responsible research associate, Dr George Abaka-Wood, is uniquely qualified in the field of REE mineral recovery by flotation processes. His PhD research succeeded in establishing the specialised flotation conditions required for REE recovery from complex iron-rich sulphide ores. Both Dr Abaka-Wood and his supervising associate, Professor Bill Skinner, are the authors of many scientific papers published in international journals on this and related subjects.

This REE research is of strategic importance at this time when the Australian Government is implementing its [Critical Minerals Strategy](#), which in large part is driven by China's domination of the world's REE supply chains. If successful, this research could be instrumental in facilitating a new long-term supply of REE as a by-product of copper-gold mining operations in northeastern South Australia.

#### **Commenting on this research agreement Havilah's Technical Director, Dr Chris Giles, said:**

"We are very pleased to have initiated this collaborative research with UniSA, which has allowed us to tap into the highly specialised REE recovery expertise and supporting facilities that are available in South Australia.

"This research is key to determining whether it is possible to economically recover REE as a by-product from the Kalkaroo copper and gold ores.

"Importantly, any recovery of REE as a by-product would be underpinned by copper and gold production and so potentially enable a steady supply of REE to help fill Australia's critical minerals needs over a long period.

“The value upside for Havilah is that if REE can be economically recovered in a mineral concentrate as a by-product of the standard copper and gold recovery processes it potentially provides a further revenue stream for the Kalkaroo copper-gold-cobalt project.

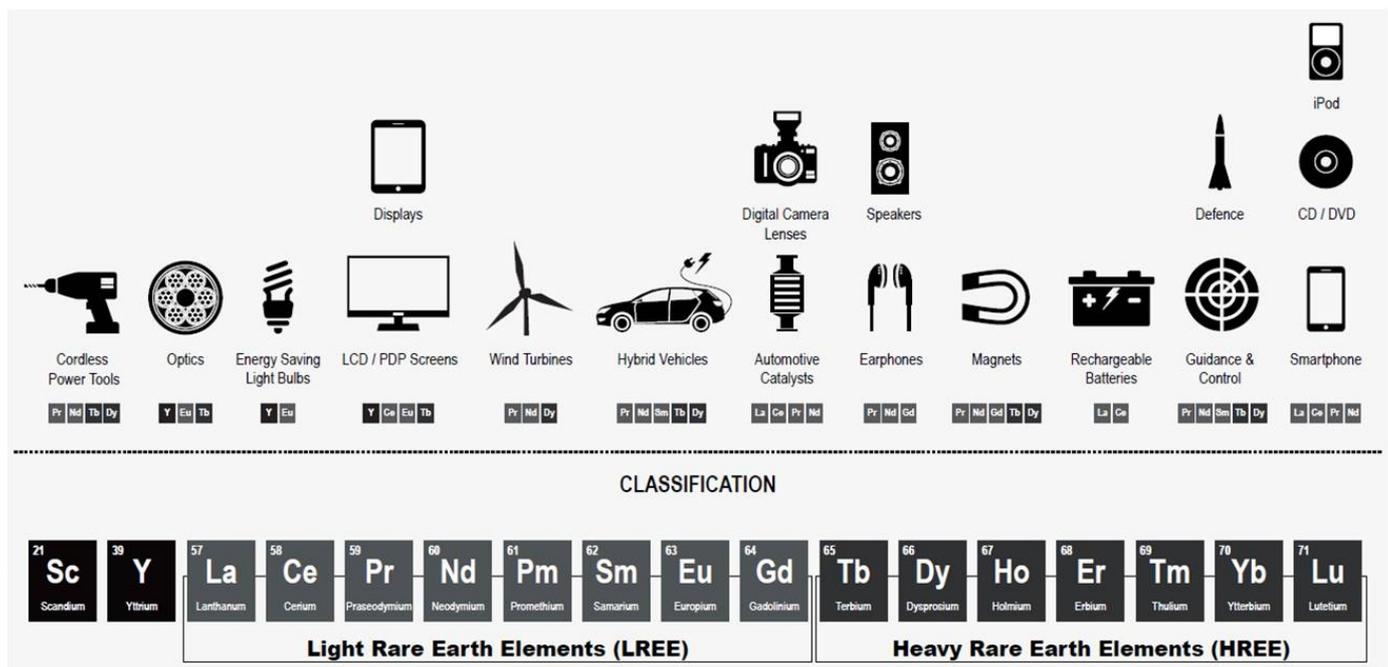
“Havilah’s other project work and exploration drilling will continue as planned and will not be affected by this REE research project, which will be funded via Portia gold mining royalty payments received during the quarter ended 30 April 2020.” he said.

### About Rare Earth Elements

REE are a related group of 16 elements (lanthanides plus Yttrium) that are not particularly rare and are typically widely dispersed in the earth’s crust. However, there are limited minerals containing appreciable levels of REE and they tend to only form economic concentrations under rather uncommon geological conditions. For this reason REE are currently strategic and critical minerals for industry.

The lanthanide series of elements can be further subdivided into light-REE and heavy-REE. Light-REE are generally more abundant, and less valuable than the heavy-REE.

REE have a wide variety of important and often energy saving modern age usages because of their spectrum of slightly varying chemical behaviours. For example, modern brushless electric motors as used in power tools and many electric vehicles rely on powerful new generation magnets that use Dysprosium (**Dy**) + Neodymium (**Nd**) + Praseodymium (**Pr**) + Terbium (**Tb**) compounds as vital components. Some of the many other uses of REE are summarised in the diagram below.



Acknowledgement of source for the above diagram: China Water Risk report “Rare Earths: Shades of Grey-Can China continue to fuel our clean and smart future?” (published June 2016).

### About the Kalkaroo Copper-Gold-Cobalt Project (HAV 100% ownership)

The Kalkaroo project is Havilah’s flagship mineral project, located approximately 400 kilometres northeast of Adelaide and 95 km northwest of the regional mining centre of Broken Hill, in proximity to the transcontinental railway line and Barrier highway. The project comprises several granted Mining Leases and hosts a JORC Ore Reserve that contains copper and gold amenable to a large-scale open pit mining operation. Havilah also owns

the Kalkaroo Station pastoral lease, a non-mineral asset on which the Kalkaroo project is located, reducing land access risks for the project ([refer to ASX announcement of 18 June 2019](#)).

During the course of recent shallow gold resource drilling at West Kalkaroo, Havilah has also confirmed elevated REE levels in oxidised saprolite gold ore, including:

**20 metres of 4,152 ppm TREO\*, 1.57 g/t gold and 0.58% copper from 62-82 metres** in aircore drillhole **KKAC0491** ([refer to ASX announcement of 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 and Tb, comprising 29% of the TREO.

Samples from drillhole KKAC0491 will be the subject of initial study under the collaborative research agreement. At the time, Havilah noted that “the confirmation of significant REE mineralisation in association with copper and gold in a new drillhole is very positive and justifies follow-up REE mineral recovery studies using these new drill samples.”

Havilah’s present strategy was endorsed by international REE expert, Emeritus Professor Ken Collerson, who recommended initiation of **“detailed studies into the REE hosting minerals and the ability to recover these minerals by trialing various separation techniques on suitable samples. It is highly recommended that such studies should commence on samples from the advanced Kalkaroo project. Project economics will be positively impacted if Havilah can demonstrate successful recovery of a REE mineral concentrate from run of mine Kalkaroo oxide and sulphide ore. Additionally, this study shows that Kalkaroo is advantaged in having the highest proportion of the more valuable heavy-REEs”** ([refer to ASX announcement of 19 February 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>, CeO<sub>2</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>, Lu<sub>2</sub>O<sub>3</sub> and Y<sub>2</sub>O<sub>3</sub>. Refer to Appendix 1 in the [ASX announcement of 23 April 2020](#) for further details. Note ppm equals parts per million. 1ppm = 1 g/t (gram/tonne).*

#### Cautionary Statement

This announcement 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. 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 Statements

The information in this announcement that relates to Exploration Targets, Exploration Results, Mineral Resources and Ore Reserves is based on data and information 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 under consideration and to the activities being undertaken 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 announcement of the matters based on his information in the form and context in which it appears.

Except where explicitly stated, this announcement contains references to prior exploration results, 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.

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

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

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