Pure Minerals Limited

05 September 2018

ASX Announcement

OUTSTANDING MANGANESE AND COBALT LEACH KINETICS IDENTIFIED AT BATTERY HUB PROJECT

- **Results exceed expectations, with 95%-99% manganese recovery and 85%-90% cobalt recovery**
- **Exceptionally fast leach kinetics, with leaching equilibrium met in less than 30 minutes**
- **Weak leach kinetics of contaminant iron indicates a higher-purity solution can be produced**
- **Confirms potential to produce high-purity manganese products and cobalt across the major types of mineralisation at Battery Hub**
- **Pure Minerals to assess refining metallurgical testwork and calculating a maiden resource**

Pure Minerals Limited (ASX: PM1) ("Pure Minerals", "the Company") is pleased to announce the results of preliminary leaching testwork for the Battery Hub manganese-cobalt project, located in Western Australia's Gascoyne region.

The objectives of the testwork were to confirm that the two primary forms of manganese-cobalt mineralisation at Battery Hub (stratiform mineralisation from the Pools prospect, and detrital mineralisation from the Julia prospect) are amenable to atmospheric leaching and the production of high-purity manganese sulphate, electrolytic manganese dioxide (EMD), electrolytic manganese metal (EMM) and cobalt.

The results of the testwork were very encouraging:

- Manganese extractions were very high for both the Pools and Julia, with final leach extractions of between 95% and 99%.
- Final cobalt recoveries were also very good, with results of between 85% and 90%.
- The leaching kinetics of manganese and cobalt were fast, approaching equilibrium in 15 to 30 minutes under the test conditions.

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- Significantly, contaminant iron has slow leach kinetics, suggesting simpler downstream processing to produce a high-purity product. Results were enhanced with tests using lower acid concentrations. For example:
    - For the detrital (Julia) sample, after 20 minutes 91.6% of the manganese and 81.2% of the cobalt were leached, whereas only 3.8% of iron leached
    - For the stratiform (Pools) sample, after 20 minutes 97.6% of the manganese and 84.7% of the cobalt were leached, whereas only 7.6% of iron leached

Testwork was conducted by the CSIRO, located in Western Australia, and supervised by METS Engineering ("METS").

Sample Sources

The samples leached were from the same composite RC drilling samples utilized in the preliminary metallurgical testwork, the results of which were announced on 12th June, 2018. Two types of manganese-cobalt mineralisation were tested: detrital/lateritic mineralisation from the Julia prospect and primary stratiform mineralisation from the Pools prospect. The samples were aimed to be representative of a potentially mineable block of each type of mineralisation, with each sample a composite of multiple drill hole intercepts. The average assay grade of each composite sample is outlined in Table 1, below.

Composite	Mn (%)	Fe_2O_3 (%)	SiO_2	Al_2O_3	Co
Julia (Detrital)	10.8	43.2	13.3	11.7	0.030%
Pools (Stratiform)	11.1	29.2	37.7	6.3	0.020%

Table 1: Composite head grades of samples utilised

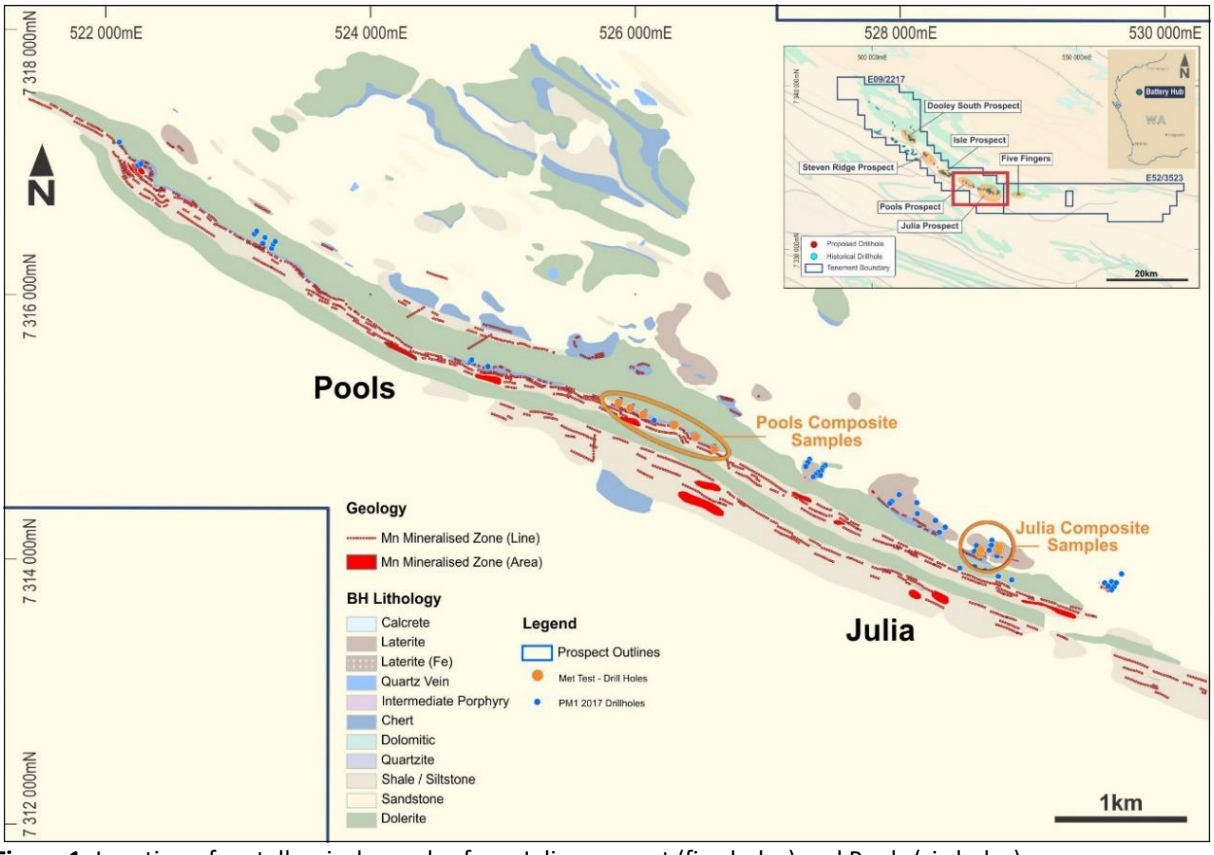

Figure 1: Location of metallurgical samples from Julia prospect (five holes) and Pools (six holes)

The sample locations, and the Pools and Julia prospects in their entirety, represent only a small portion of the 70km-long strike length of manganese-cobalt mineralisation identified at Battery Hub.

Further Testwork

The results confirm and exceed Pure Minerals' expectations, first outlined in June 2018, of attractive leach recoveries at Battery Hub.

Most significantly, Pure Minerals has de-risked a key component of the Battery Hub project prior to engaging in the more expensive aspects of mineral development, such as resource drilling and bulk sampling – potentially significant given the 70km-long strike length of mineralisation. The successful leaching testwork provides Pure Minerals with greater confidence to advance the project further.

METS and the CSIRO have recommended Pure Minerals develop next stage of scope of work for further investigation and optimisation of the leaching conditions, separation / purification options and the recovery of individual high purity Mn and Co products.

High-Purity Manganese Products

Hydrometallurgical leaching, such as that used in the proof-of-concept testwork conducted by METS and the CSIRO, has the potential to produce high-purity/high-value manganese products that are used in the electric vehicle (EV) battery sector. These products include manganese sulphate, electrolytic manganese metal (EMM) and electrolytic manganese dioxide (EMD).

Manganese sulphate, or more specifically manganese sulphate monohydrate, is used as a fertilizer but also EV batteries and as a precursor to the production of EMM and EMD, both of which are also key products for batteries and other applications. Manganese sulphate prices tend to vary between US$500/mt and US$1,200/mt, depending on purity.

Electrolytic manganese dioxide (EMD) is traditionally used in zinc–carbon batteries and in zinc manganese dioxide rechargeable alkaline (Zn RAM) batteries.

More recently, there is considerable interest in using manganese as a possible cathode for lithium ion batteries, such as Nickel Manganese Cobalt (NMC) batteries, or Lithiated Manganese Dioxide (LMD) and Lithiated Manganese Oxide (LMO) batteries. According to Avicenne Energy (2017), NMC battery formulations are expected to be the largest section of the market by 2025, while the LMO batteries are expected to show the greatest growth in percentage terms (4x growth) over the same period.

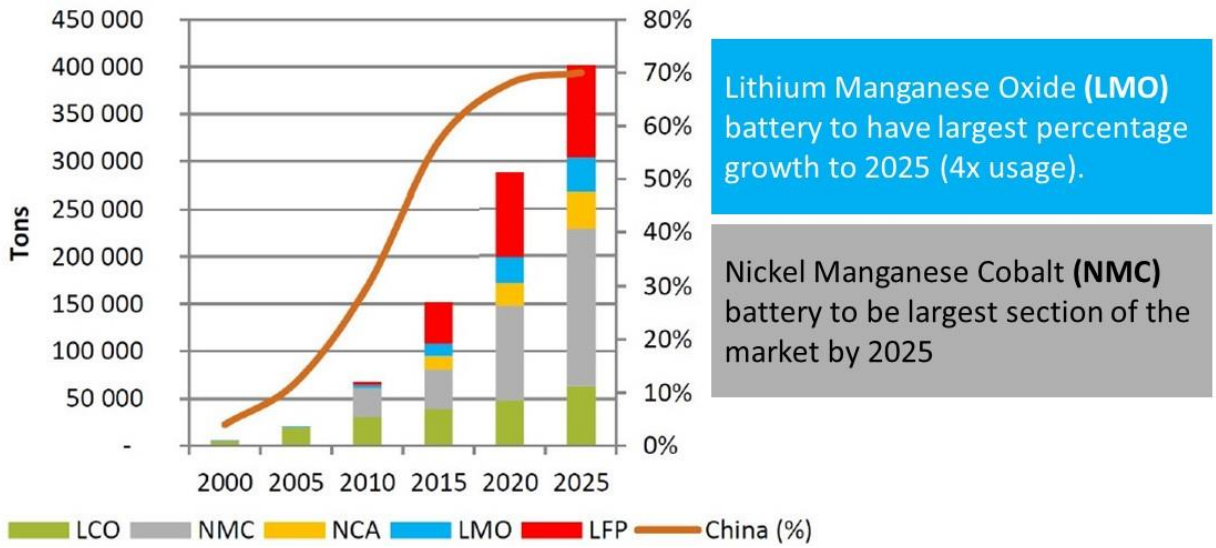

Figure 2: Growth projections for various battery types. Source: Avicenne Energy, 2017

The standard mix of used in LMD/LMO batteries contains 4% lithium, 61% manganese and 35% oxygen by atomic weight. The LMD/LMO battery has high power output, thermal stability and enhanced safety when compared to other lithium ion battery types and therefore it is currently being used by Nissan, BMW and Chevrolet.

Traditionally, high-purity manganese products are produced from manganese ore typically imported into China. The U.S. is the largest consumer of high-purity manganese products. However, given the attractive leach kinetics, Pure Minerals sees the opportunity to produce such products within Australia and on site and export directly to the end user.

On 24 August 2018, the S&P Global Platts weekly 99.7% electrolytic manganese metal assessment was between US$2,580/mt and US$2,630/mt FOB China. Chinese export EMM prices have seen a 36% increase since on 18 May this year when the price was US$1,915/mt.

Cobalt

Cobalt represents a significant by-product of hydrometallurgical leaching of manganese at Battery Hub. It is associated with manganese mineralisation at all assayed prospects and was identified in every drill hole containing manganese mineralisation from the December 2017 drill program. It's grade typically correlates with the grade of manganese and some prospects, such as Isle, exhibit a larger cobalt-to-manganese ratio than others. At the Isle prospect, cobalt grades in drilling exceeded 0.10% Co.

Cobalt's primary use is in lithium ion batteries, where it stabilizes the chemistry of the battery. Given the increased demand, car makers are scrambling to find new raw materials in more stable areas of the world, free of child and slave labour, and from cobalt concentrates with low arsenic content. Accordingly, prices have driven up from US$25,000/tonne in 2016 to up to US$95,000/tonne in March 2018. The current cobalt price is approximately US$64,500/tonne.

For and on behalf of the Board,

Mauro Piccini
Company Secretary

Competent Persons Statements

The information in this report that relates to the Processing and Metallurgy for the Battery Hub project is based on and fairly represents information and supporting documentation compiled by Damian Connelly who is a Fellow of The Australasian Institute of Mining and Metallurgy and a full time employee of METS Engineering (METS). Damian Connelly has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking 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'. Damian Connelly consents to the inclusion in the report of the matters based on his information in the form and context in which it appears