

**ASX:TLG** 

## **Talga Presentation at Euro Mine Expo**

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### **Corporate Information**

ASX Codes TLG, TLGOA Shares on issue 204.1m Options (listed) 44.0m Options (unlisted) 32.6m

Company Directors Terry Stinson Non-Executive Chairman

Mark Thompson Managing Director

Grant Mooney Non-Executive Director

Stephen Lowe Non-Executive Director

Ola Mørkved Rinnan Non-Executive Director Advanced materials technology company, Talga Resources Ltd ("**Talga**" or "**the Company**"), is pleased to provide a copy of the presentation to be delivered today, 13th June 2018, by Chief Operating Officer Martin Phillips at the Euro Mine Expo in Skellefteå, Sweden.

The presentation is available on the Company's website via the link below:

http://www.talgaresources.com/irm/content/presentations.aspx?RID=301

For further information, visit www.talgaresources.com or contact:

Mark Thompson Managing Director Talga Resources Ltd T: + 61 (08) 9481 6667 Martin Phillips Chief Operating Officer Talga Resources Ltd T: + 61 (08) 9481 6667

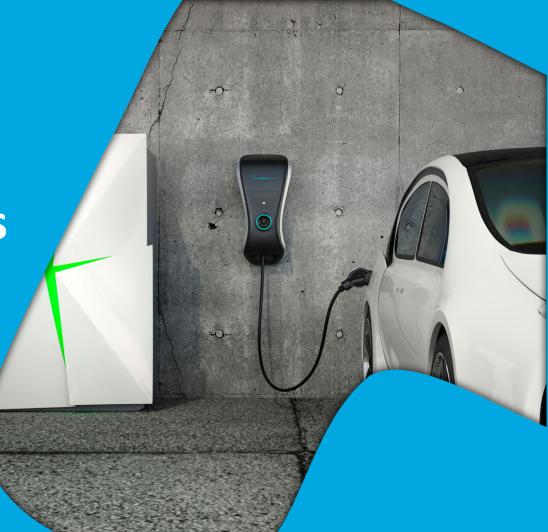




# **Talga Resources**

Sustainable Mining for European Battery Supply Chains

Martin Phillips, COO Euro Mine Expo, Skellefteå 13 June 2018



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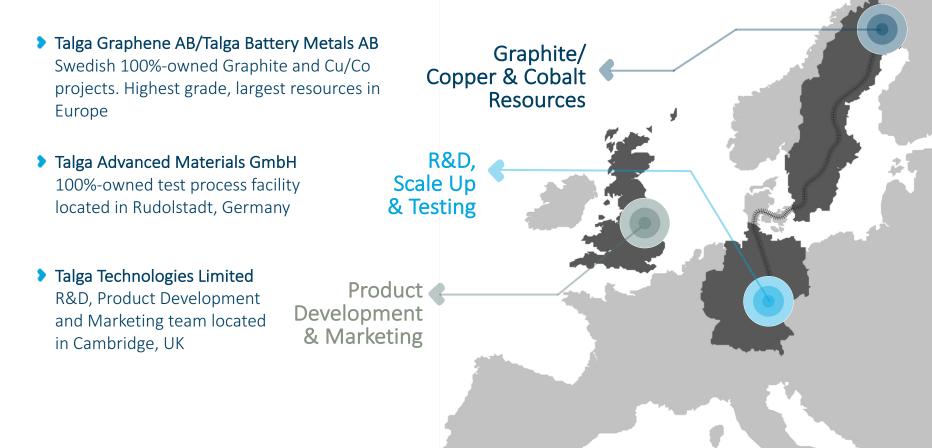
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## **TALGA'S EUROPEAN OPERATIONS AND BUSINESS UNITS**

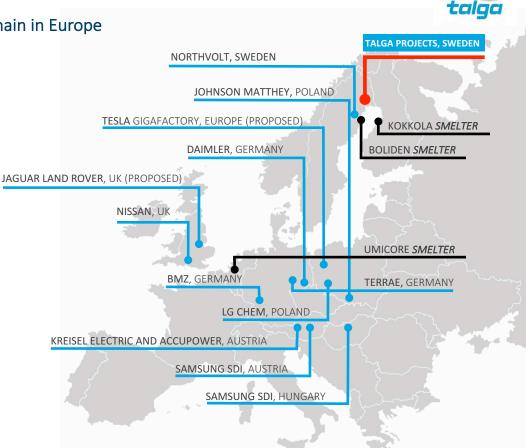
Vertically Integrated Supply Chain



# **EUROPEAN SUPPLY CHAIN**

Placed to supply fast growing battery supply chain in Europe

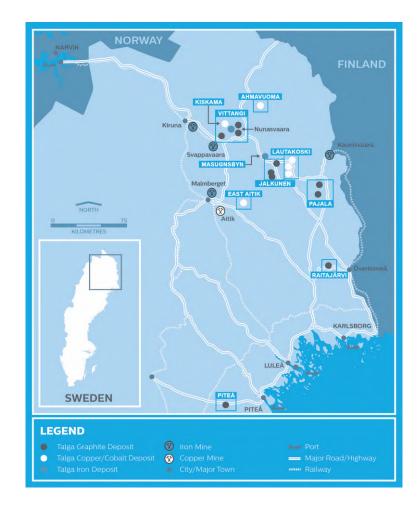
- Global Li-ion battery manufacturing capacity set to double by 2021
- Multiple Li-ion 'Gigafactories' underway or planned
- Graphite and Cobalt is on EU critical raw materials list, with mandate to develop independent supply
- Majority of battery minerals currently imported from China and Africa
- Talga's Swedish deposits represent a potentially important and strategic new source of supply
- Graphite in the ground at Nunasvaara can supply 5 'Gigafactories' for the next 25 years



## **GRAPHITE AND COBALT PROJECTS**

Long term mineral supply chain to Europe

- Norrbotten location proximal to roads and railway with links to ports and largest cobalt smelter in world (Kokkola, Finland) and others (Skellefteå)
- Abundant, low cost (~US\$0.03/kWh) and sustainable power (>18 TW/year Hydro & >12 TW/year Wind)
- Highly prospective Aitik mining district; Europe's largest operating copper-gold mine (36 million tonnes/annum)
- Potential toll treatment opportunities to nearby smelters as well as stand alone/concentrate export
- Local Li-ion battery 'Gigafactories' being built eg, Northvolt, TerraE and others



## **TALGA ADVANCED MATERIALS GMBH - GERMANY**

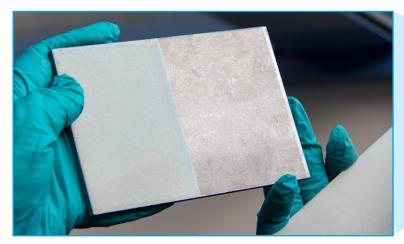
Scaling up proprietary graphite-graphene processing technology



- 100%-owned proprietary test facility scaling up process for production of graphene and micrographite
- Output of testwork available for product development collaborations with industrial partners & customers
- Commissioning of next scale up (phase 3) underway

# **TALGA TECHNOLOGIES LTD - UK**

Industrial product development with R&D partnerships and formal agreements



Some current collaborations include:



# Sweden Mining

Sustainable methods for mining graphite, cobalt and copper for battery supply chains

## **VITTANGI GRAPHITE PROJECT - TRIAL MINING**



Collaboration and innovation in sustainable methods for exploration and mining



## **VITTANGI GRAPHITE PROJECT**

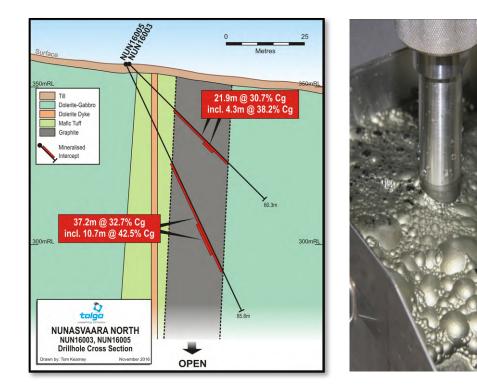




# **GRAPHITE PROJECTS – MINERAL RESOURCES**



Nunasvaara Graphite Mineral Resource expanded in 2017 to 12.3 Mt @ 25.5%Cg, taking Talga's total graphite resources to 48.1 million tonnes containing 8.1 million tonnes graphite to date



Nunasvaara JORC (2012) Mineral Resource (17% Cg cut-off)

JORC 2012 Classification	Tonnes	Graphite (%Cg)
Indicated	10,700,000	25.7
Inferred	1,600,000	23.9
Total	12,300,000	25.5

Jalkunen JORC (2012) Mineral Resource (5% Cg cut-off)

JORC 2012 Classification	Tonnes	Graphite (%Cg)
Inferred	31,500,000	14.9

Raitajärvi JORC (2004) Mineral Resource1 (5% Cg cut-off)

JORC 2004 Classification	Tonnes	Graphite (%Cg)
Indicated	3,400,000	7.3
Inferred	900,000	6.4
Total	4,300,000	7.1

### Note: For details see TLG ASX releases 7 Nov 2014, 29 Aug 2017 12

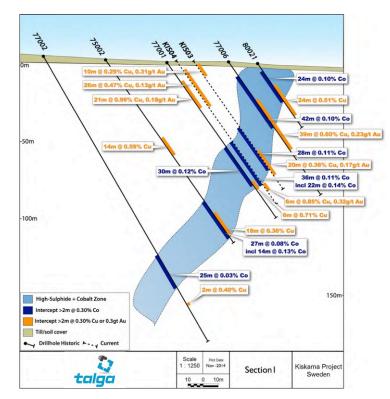
## **KISKAMA COBALT PROJECT**

Sweden's largest cobalt deposit with valuable by-product copper and gold, characterised as IOCG-type

**Kiskama** currently defined by >105 drillholes within a ~900m long and **15 to 40m wide** mineralised zone, open along strike and at depth

- 42m @ 0.10% Co, 0.41% Cu from 11m depth (Kis77006) including 27m @ 0.14% Co, 0.50% Cu
- > 33m @ 0.10% Co, 0.56% Cu from 28m (Kis80017)
- 30m @ 0.12% Co, 0.14% Cu from 67m (Kis 770001)
- > 28m @ 0.11% Co, 0.51% Cu from 59m (Kis72005)
- **36m @ 0.11% Co**, 0.27% Cu, 0.13g/t Au from 66m (2014 Kis04)
- 40m @ 0.09% Co, 0.24% Cu, 0.14g/t Au from 50m (2014 Kis03)
- 17m @ 0.12% Co, 0.91% Cu from 34m (Kis80006)

**High Metallurgical Recoveries** in initial flotation and Kell<sup>™</sup> process test: Up to 91% recovery of Cobalt to concentrate and 99% to leachate solution





## **AHMAVUOMA COBALT PROSPECT**

High grade early stage Cobalt/Copper/Gold discovery



- Three exploration licenses covering 40km<sup>2</sup>
- No outcrop. Discovered 1978 with 17 scout diamond holes 1982-86 and 5 diamond holes in 2004
- Broad zones of cobalt-copper-gold mineralisation around narrower, higher-grade zones.
- Historical drilling highlights include hole AHM4:
  - 52m @ 0.24% Co, 0.59% Cu, 0.17g/t Au from 60m including 21m @ 0.38% Co, 1.12% Cu, 0.42g/t Au
  - Re-assay of previously unsampled zones returned: 73.1m @ 0.16% Co and 0.24% Cu from 34m downhole



# LAUTAKOSKI COBALT PROSPECT – NEW DISCOVERY

'Wildcat' diamond drillhole intercepted strongly altered and broad copper-cobalt-gold zone

- 85.8m @ 0.18% Cu, 153ppm Co from 14.2m (LAU16001) including 15m @ 0.41% Cu, 232ppm Co from 85.0m with grades present up to 1.5% Cu, 0.27g/t Au and 565ppm Co
  - 10 cm 10 cm 10 cm 10 cm 10 cm Lution the second of th
- Abundant nearby EM conductors and high grade boulders suggest further targets worthy of testing
- Next Steps: Assaying of 2017 holes, new geophysics and geochemical surveys, core petrography

# **AITIK EAST PROJECT**

Outcropping high grade Cu-Au mineralisation 25km east of Europe's largest base metal mine and mill, with similar mineral suite to Aitik

25km



**Aitik Mine (Boliden - 36Mt/a)** 2.7Bt @ 0.2% Cu, 0.2g/t Au, 1.3g/t Ag, 30g/t Mo Aitik East (Talga) Historic Rock Samples 1: 17.4% Cu, 1.9g/t Au, 189g/t Ag, 5.6% Mo 2: 3.6% Cu, 1.4g/t Au, 49g/t Ag, 4.6% Mo

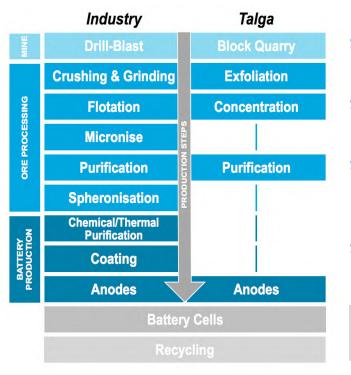
# Supply Chain Opportunities

Talga is developing the materials for Li-ion and next-gen batteries in Europe



# **TALGA ADVANTAGES IN NATURAL GRAPHITE FOR LI-ION BATTERY**

Graphite for use in batteries must be of very high quality (99.9 percent purity), sized, shaped, and the production process becomes increasingly complicated and specialised to reach anode level



- **Graphite Extraction.** High grade mining lowers environmental footprint and impacts
- Ore Processing in Northern Sweden. High purity natural graphite production and low cost ultra-low CO<sub>2</sub> power (hydro)
- Talga anode graphite has unique and natural morphology and size suitable for batteries, without spheronising or coating steps, lowering production cost and environmental impacts
- Battery grade graphite produced in Europe for European markets

higher performance with less manufacturing steps = lower eco-impact



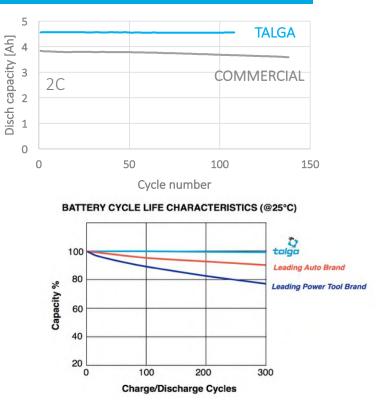
# **TALGA MICROGRAPHITE PRODUCES HIGH PERFORMANCE BATTERY**

Benchmarked with current market leading graphite product at leading independent global facility

### 100% Talga Graphite as Active Material in 4.5Ah NMC pouch cells



- > Improves power and energy performance
  - High capacity retention at high power (same capacity of 4.5Ah at 0.5C and 2C)
  - >90% first cycle efficiency
  - ~20% power above commercial reference
- Longer lifespan through great stability
  - Very high stability up to 300 cycles (cycle testing ongoing)
- > Improves charging and discharging rates



## **TALGA'S EXFOLIATION PROCESS TECHNOLOGY**





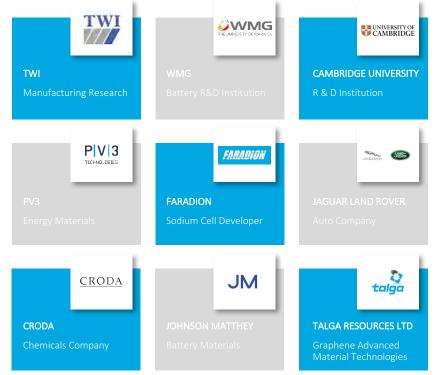
## **TALGA PARTNERS THROUGH 'FARADAY CHALLENGE'**

UK Government funding through Innovate UK's £246 million 'Faraday' initiative to create new battery technologies and local supply chains

Department for Business, Energy & Industrial Strategy

Innovate UK

- Talga wins 70% rebate against eligible costs (~A\$1.5m budget) over 1-2 year period for 3 programs:
  - **Scale up** of Li-ion electrode materials; higher performance current
  - Graphene-silicon and alloy anodes (Safevolt);
  - **Sodium-ion** batteries for automotive power applications
- Binding collaboration agreements signed with partners including Jaguar-Land Rover, Johnson Matthey, Croda, Faradion, PV3, Cambridge University and Warwick Manufacturing Group



# Many new battery technologies require graphene more than graphite e.g. **Samsung** silicon battery<sup>1</sup>

Industry needs higher capacity batteries (longer range) but not bigger/heavier. Addition of silicon up to 30%

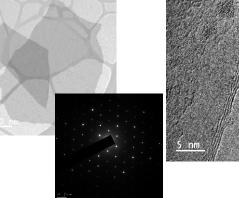
NEXT GEN BATTERY ELECTRODES ENABLED BY GRAPHENE

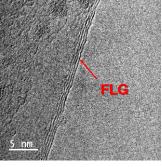
will double reversible capacity to >750 mAh/g = >50% \$ vs Standard Graphite

Talga is developing materials for current additive silicon and next gen solid silicon electrodes

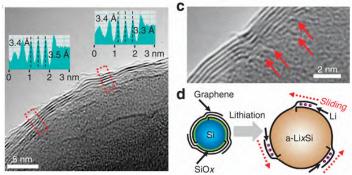
Goldman Sachs estimate an Rmb6.3bn (US\$0.9bn) addressable market by 2025 for graphene in batteries<sup>2</sup>

### TALGA GRAPHENE





## SAMSUNG GRAPHENE COATED SILICON





<sup>1</sup> Source "Graphene balls for lithium rechargeable batteries with fast charging and high volumetric energy densities", Nature Communications 8:1561. Samsung <sup>2</sup> Source "Chinas Battery Challenge; A New Solution", Goldman Sachs Feb 2017 21



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# INVESTING IN R&D – ENERGY PRODUCTS

Talga staff in-house expertise of leading battery developments





#### Sai Shivareddy Ph.D. Manager - Product Development

Heads up Talga's development of advanced carbon products for energy storage. 7 years industrial experience focusing on early stage commercialisation of novel materials and energy technologies.

- Previous positions include leading graphene research and commercialisation efforts at Tata Group in collaboration with the Cambridge Graphene Centre.
- Founder of multiple energy harvesting and storage technologies.



### Claudio Capiglia Ph.D. Director of Battery Technologies

Over 20 years experience in the battery industry in Japan. Exclusive know-how of the research, development and industrialisation of advanced materials and electrodes for Li-ion battery manufacturing.

Previous Professor and head of Battery Group/ Italian Institute Technology
Cofounder and Director of the original Li-ion cell manufacturers in Europe
Former Senior Scientist for solid state battery technologies for Hybrid Electric Vehicles (HEVs) at Toyota.



### Fengming Liu Ph.D. Senior Scientist - Batteries

Over 11 years industry experience. Focus on programs for silicon and new generation battery anodes under 'Safevolt', a Talga led project granted financial assistance under the UK Government's Faraday Battery Challenge.

- Previous positions include co-founder and Senior Scientists for UKbased silicon anode specialist Nexeon Ltd.
- Responsible for 10 Li-ion battery anode patents to date.

# **OUR PRODUCTS**

We make added value and enhanced Products used across four key sectors, with batteries being one in energy



### CONSTRUCTION

- Combined graphite and graphene mixtures for high strength building materials
- Conductive screeds for de-icing systems
- Conductive flooring, wall panel systems combined with heating or cooling systems



## ENERGY

- Micro-graphite for current lithium-ion high power batteries
- Next generation anodes with higher energy performance
- Conductive additives for lithium-ion battery cathodes and anodes



### COATINGS

- Eco-friendly chromefree based pretreatment coatings
- Pre-fabrication and post fabrication anticorrosion coatings
- Marine anti-fouling coating systems



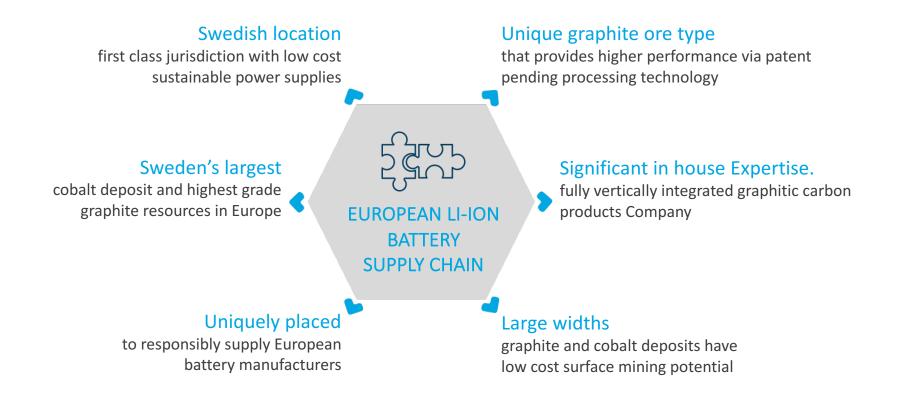
### **COMPOSITES & RESINS**

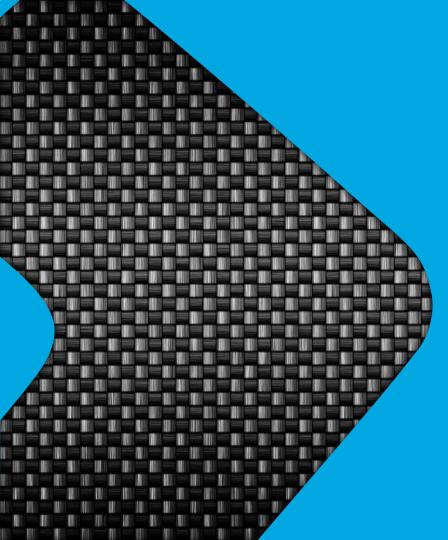
- High strength carbon fibre resins
- Engineered plastics and polymer composites
- Lightning strike protection and EM shielding
- Thermal sink polymer resins
- Conducting inks and pastes

## **TALGA BATTERY SUPPLY CHAIN OPPORTUNITY**

### Talga battery materials investment summary







## **CONTACT US**

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Talga Technologies Limited | UKUnit 15-17 Cambridge Science Park, Milton Road, Cambridge CB4 0FQ, UK

Talga Advanced Materials GmbH | GermanyProf.-Hermann-Klare-Str. 25, 07407 Rudolstadt, Germany

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## **APPENDIX AND STATEMENTS TO ACCOMPANY MINERAL RESOURCES**

#### **Competent Person's Statements**

The information in this document that relates to exploration results is based on information compiled by Amanda Scott, a Competent Person who is a Member of the Australian Institute of Mining and Metallurgy (Membership No.990895). Amanda Scott is a full-time employee of Scott Geological AB. Amanda Scott has sufficient experience, which is relevant to the style of mineralisation and types of deposits under consideration and to the activity which has been undertaken to qualify as a Competent Person as defined in the 2012 edition of the Australiaan Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code). Amanda Scott consents to the inclusion in the report of the matters based on her information in the form and context in which it appears.

The information in this report that relates to Graphite Resource Estimation for the Vittangi Project is based on information compiled by Oliver Mapeto and reviewed by Albert Thamm. Both Mr Mapeto and Mr Thamm are consultants to the Company. Mr Mapeto is a Member of both the Australian Institute of Mining and Metallurgy (Membership No.306582) and Australian Institute of Geoscientists (Member No 5057) and MR Thamm (Member No 203217) is a Fellow Member of the AusIMM.

Both Mr Mapeto and Mr Thamm have sufficient experience relevant to the styles of mineralisation and types of deposits which are covered in this document and to the activity which both are 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" ("JORC Code"). Mr Mapeto and Mr Thamm consent to the inclusion in this report of the Matters based on this information in the form and context in which it appears.

The information in this report that relates to Iron Ore Resource Estimation and Graphite Resource Estimation for the Jalkunen and Raitajärvi Projects is based on information compiled and reviewed by Mr Simon Coxhell. Mr Coxhell is a consultant to the Company and a member of the Australian Institute of Mining and Metallurgy. Mr Coxhell has sufficient experience relevant to the styles of mineralisation and types of deposits which are covered in this document 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" ("JORC Code"). Mr Coxhell consents to the inclusion in this report of the Matters based on this information in the form and context in which it appears.

#### **Cautionary Statement**

Any data on the scoping study referred to in this report is based on low level technical and economic assessments, and is insufficient to support estimation and economic assessments, and is insufficient to support estimation of Ore Reserves or to provide assurance of an economic development case at this stage, or to provide certainty that the conclusion of the scoping study will be realised. The Company confirms that all material assumptions and technical parameters underpinning the scoping study results and projections in this release continue to apply and have not materially changed. The use of the word "ore" in the context of this report does not support the definition of 'Ore Reserves' as defined by the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". The word 'ore' is used in this report to give an indication of quality and quantity of mineralised material that would be fed to the processing plant and is not to assumed that 'ore' will provide assurance of an economic development case at this stage, or to provide certainty that the conclusion of the scoping study will be realised.

#### **No New Information**

To the extent that announcement contains references to prior technical information, exploration results and mineral resources; these have been cross referenced to previous market announcements made by the Company. These had been disclosed to JORC 2012 standard. Unless explicitly stated, no new information is contained. The Company confirms that it is not aware of any new information or data that materially affects the information included in the relevant market announcements that assumptions and technical parameters underpinning the relevant market announcement continue to apply and have not materially changed.