

# **TALGA RESOURCES**

Developing the Vittangi Graphite and Battery Metal Projects in northern Sweden

Martin Phillips, Chief Operating Officer

Association of Mining Analysts Battery Metals in Europe London, 14 March 2019



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### > TALGA RESOURCES LTD

Emerging global advanced materials technology company with unique vertically integrated capability

➤ Focussing on graphite and graphene products for clean technology applications in the **global battery**, **coatings**, **construction and polymer composites markets**. Australian domiciled (ASX:TLG) with operations and >35 staff across UK, Germany and Sweden



**Mineral Resources** 

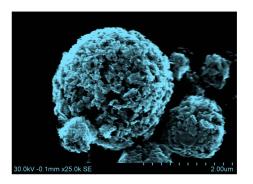
World's highest grade JORC/NI43-101 graphite mineral resource and largest in Europe.

Using low CO<sub>2</sub> power in first class investment jurisdiction of Sweden



Processing Technologies

Developing micro-to-nano graphene and graphite products via proprietary processing tech at its plant in Germany with scale and cost advantages over industry standards



Product Technologies and IP

Value added Li-ion battery and graphene products by own R&D and customer interface team in UK, with high performance for lower environmental impact and growing list of commercial partners



Headquartered in Australia (listed on ASX) with major operations and business units in Europe

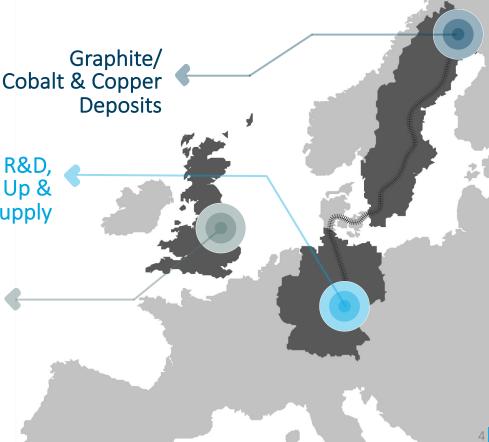
▶ Talga Graphene AB/Talga Battery Metals AB 100%-owned Graphite, Cobalt and Copper/Gold deposits in north Sweden

▶ Talga Advanced Materials GmbH Germany 100%-owned process test facility in Rudolstadt, Germany

Talga Technologies Limited
In-house product R&D team
located in Cambridge, UK

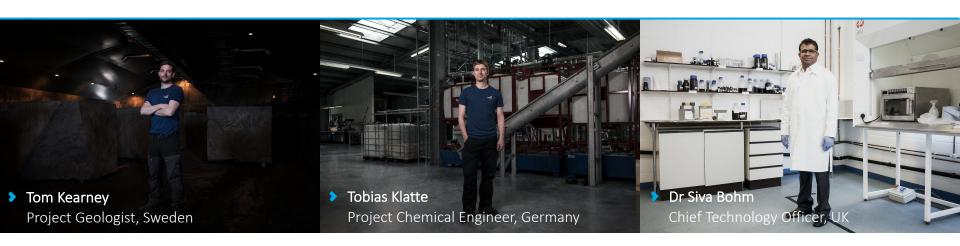
Process R&D, Scale Up & Sample Supply

Product Development & Marketing



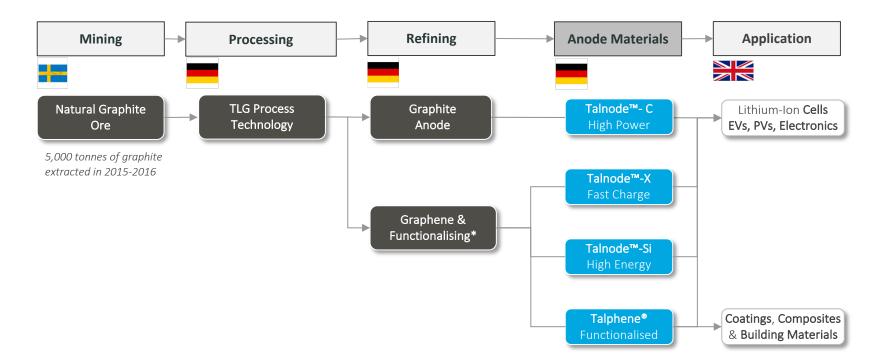
## **▶** ORE-TO-PRODUCT EXPERTISE

- **Earth scientists, project managers and stakeholder engagement specialists** undertaking ongoing exploration and progressing permitting and feasibility related surveys and studies towards concurrent mining, environmental and exploitation licence applications at Talga's Vittangi Graphene-Graphite Project
- ▶ Highly skilled engineering, processing and laboratory staff with significant industrial expertise operating pilot scale production technologies and processes to optimise proprietary engineering solutions
- **Technical sales experts and material scientists** working closely with commercial partners to enable smarter, stronger and greener products & solutions for the global battery, coatings, composite and construction industry



### **▶ TALGA'S LI-ION BATTERY MATERIALS**

Talga is developing Li-ion battery materials alongside its graphene to meet global customer demand for energy, power, life, safety and cost. R&D takes place in UK (Cambridge). Future processing and refining planned for Sweden





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



### **BATTERY PRODUCTS**

Value added Talga-developed active anode materials with superior performance in Li-ion batteries



#### Talnode - C

Engineered graphite anode for super stable lifetime and 20% higher capacity <sup>1</sup>

#### Talnode - X

Formulated graphite anode for ultra-fast charge (0-100% in 3 minutes) <sup>2</sup>

#### Talnode - Si

Graphene Silicon-anode for higher energy density (50% higher than standard)<sup>3</sup>

#### Talphene Conductive Agent (under development)

Functionalised graphene additive for Li-ion battery cathodes

Commercial samples of anode products are currently being delivered to end users, and being tested and validated towards commercial decisions

Note: These are not just purified and shaped graphite concentrates but fully formulated active materials ready to mix and coat anode current collector

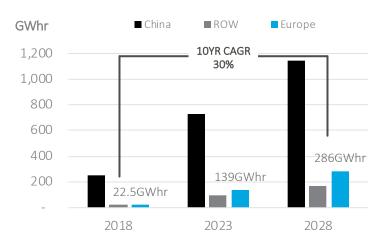
# **▶ GLOBAL MEGAFACTORIES COULD REACH 1,500 GWHR BY 2028**

Raw Materials Demand vs Li-ion Megafactory Capacity



## **EUROPEAN BATTERY MEGAFACTORIES**

30% growth rates underwritten by EU emission targets and legislation against ICE



- **Electrification of transport** is driving automotive markets and demand for more EVs
- Location advantage to supply European Li-ion battery supply chain



### **▶ LI-ION BATTERY SUPPLY CHAIN**

Lithium-ion batteries use refined carbon materials mined and processed mainly from China with synthetic and natural graphite as raw material

Mi	ning	Processing	Refining	Anode Production	Li-ion Cells
Quality	10% C	94-96% C Size:75um->350um	99.95+% C Micronised Shaped, Size:10-20um	99.95+% C Surface Treated, Coated or Si/Graphene Enhanced	Current collector
Product	Ore	Natural Flake Graphite Refractory or Steel Grade	Natural Spherical Battery Grade	Active Anode. Specialty Chemical Grade to Customer Spec*	Li-ion battery cell for Portable, Stationary Transport/EV packs
Prices	US\$	\$ 0.75 - 1.5/kg	\$ 3 - 4/kg	\$ 8 – 13/kg (Standard energy) \$ 15 – 20/kg (High energy) \$ 25 – 55/kg (Si/SiO energy)	\$ 127/kWhr (2018)
Players — Miners —		— Micronisers/Refiners —	— Anode Makers —————	- Cell Manufacturers –	
	China/Asia Mozambique/Af Brazil/S.A Europe US	700 kt 100 kt 100 kt 100 kt 50 kt 50 kt	China 120 kt Brazil 30 kt US 5 kt	BTR New Energy Shanshan Hitachi Chem. Mitsubishi Chem. JFE Carbon Nippon Carbon	CATL BYD LG Chem. Samsung Panasonic Yuasa

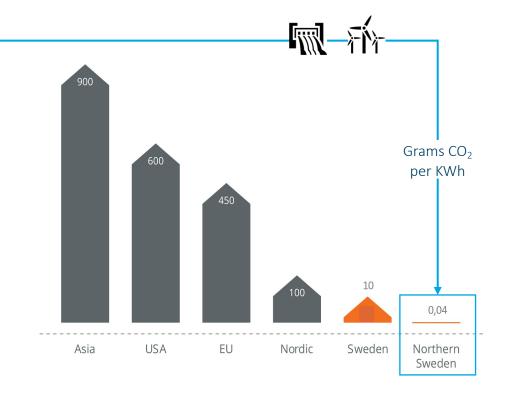


### NORTH SWEDEN ADVANTAGES

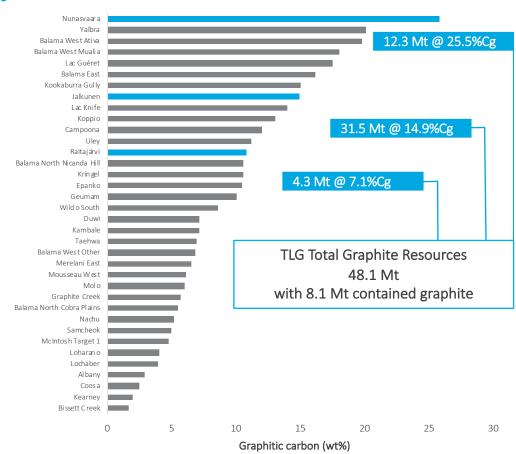
New source of long term mineral supply chain to Europe and Asia

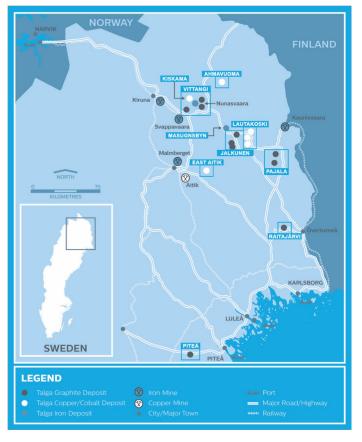
- Low cost and low CO<sub>2</sub> sustainable power (over 18 TW/year Hydro & 12 TW/year Wind)
- Quality existing infrastructure roads and railway with links to ports and smelters
- Close to emerging European battery factories in Sweden, Poland, Hungary & Germany
- Quality long term operating and investment jurisdiction with 22% corporate tax rate, 0.2% mineral tax rate





## **▶** GLOBAL LEADING GRAPHITE RESOURCES





Source: www.techmetalsresearch.com

## VITTANGI GRAPHITE PROJECT

Premier investment and logistic location

- Talga's large deposits in Sweden represent a strategic European and Global supply opportunity
- Vittangi Project alone has JORC Mineral Resources of 12.3 Mt @ 25.5%Cg (10.3Mt Indicated) in the Nunasvaara deposit
- Close proximity to road, rail and export facilities
- Northern Sweden ideal location for Li-ion battery materials refinery
- Permit processes underway for mining, processing and refining
- Pre Feasibility Study due end Q1 2019

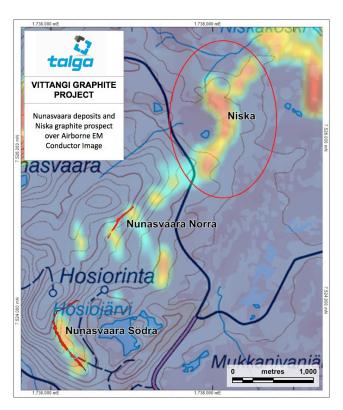




NORWAY

### > VITTANGI GROWTH GRAPHITE EXPLORATION TARGETS

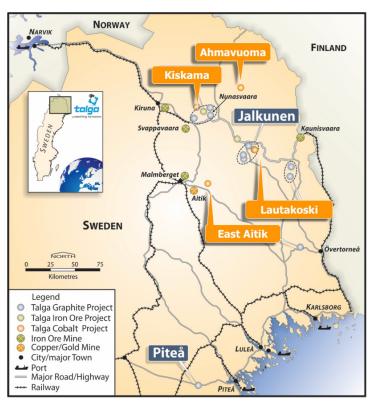
Multiple conductors support huge growth potential along strike from Nunasvaara resource



- **▶ Drill program** of ~20 diamond core holes for ~1,600m underway
- Targeting extensions to the high grade Nunasvaara North resource for future development potential, permitting and planning
- Scheduled to **finish in late March-early April** with sample results to be released when received and analysed
- Several EM conductors with high grade surface samples (up to 39%Cg)¹ extend for approximately 15km strike within Vittangi
- Other JORC mineral resources already defined include Jalkunen (31.5Mt @ 14.9%Cg) and Raitajärvi (4.3Mt @ 7.1%Cg). See Appendix for details

### > TALGA'S BATTERY METAL PROJECTS

Talga has built a suite of highly prospective cobalt mineral assets in parallel to its graphene-graphite projects



**Kiskama** Sweden's largest cobalt deposit with valuable byproduct copper and gold characterised as IOCG-type.

Ahmavuoma drilling highlights include:

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

Lautakoski 'wildcat' discovery drilling highlights include:

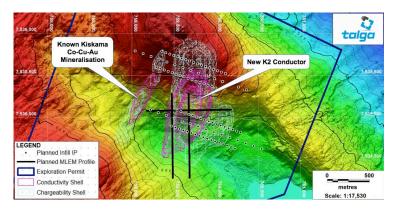
**85.8m @ 0.18% Cu, 153ppm Co** from 14.2m with grades present up to **1.5% Cu, 0.27g/t Au** and **565ppm Co** 

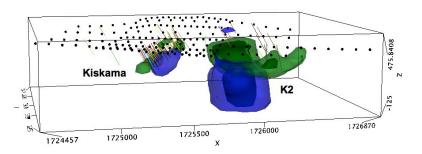
Aitik East surface rock sampling just 25km east from Europe's largest copper-gold mine Aitik (36Mt/annum) include:

**4.8% Cu, 1.2g/t Au, 66g/t Ag**, 0.6% Mo plus anomalous levels of Te and Bi

### > THE KISKAMA COBALT PROJECT

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





113 historic drillholes define a ~900m long and **15 to 40m wide** mineralised zone, open along strike and at depth. Intercept highlights include:

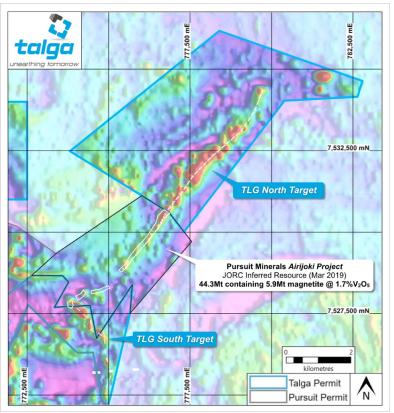
- **42m @ 0.10% Co**, 0.41% Cu from 11m depth including **27m @ 0.14% Co**, 0.50% Cu (Kis77006)
- **33m @ 0.10% Co**, 0.56% Cu from 28m (Kis80017)
- ▶ 36m @ 0.11% Co, 0.27% Cu, 0.13g/t Au from 66m (2014 Kis04)
- **17m @ 0.12% Co**, 0.91% Cu from 34m (Kis80006)

New large conductor (K2) located 500-1000m to the east has a conductive signature at least twice as strong and double the size of original Kiskama deposit

Permitting under way for K2 drill testing to commence in conjunction with maiden JORC resource drilling at Kiskama

# > VITTANGI VANADIUM PROSPECT

Emerging magnetite-hosted vanadium potential defined by adjacent resource development

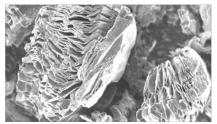


- Drilling by Pursuit Minerals Ltd (ASX:PUR) adjacent to Talga's Vittangi project tenements have intercepted exceptional thickness of vanadium mineralisation including 122m @ 2.2%V<sub>2</sub>O<sub>5</sub> (mag conc) 0.6% V<sub>2</sub>O<sub>5</sub> whole rock, with good mass pull recoveries <sup>2</sup>
- On 8 Mar 2019 PUR announced maiden JORC Inferred resources totalling 44.3Mt containing 5.9Mt magnetite at 1.7%V<sub>2</sub>O<sub>5</sub> (mag concentrate) for 100,800 tonnes V<sub>2</sub>O<sub>5</sub>
- A distinct high amplitude magnetic signature strikes for >4km (north) and 2km (south) ¹ within Talga's permits
- The potential for development is considered high in this current magnetite mining district with excellent infrastructure. PUR have announced a scoping study is underway and due in April. Talga will review its options once the adjacent scoping study is published by PUR



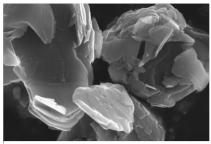
### **ADVANCED MATERIALS**

### Graphene and graphite product from processing of Vittangi project ore



#### Talphite

High purity micro-graphite produced using proprietary electrochemical exfoliation and concentration process. Dry powder consisting of agglomerates of graphene flakes and graphene nanoplatelets. Can be used in anode products or as a pre-cursor to make graphene.



#### **Talphene Nano-Platelets**

Multi-layered platelets of graphene made using combinations of electrochemical exfoliation and proprietary processes. Produces a homogeneous powder with a very high surface area and low powder density. Dispersing agents are provided under collaboration agreement to use in 2-pack or 1 pack resin media.



#### **Talphene Flakes**

Few layer graphene flakes made using the electrochemical exfoliation process and collected in a formulated liquid suspension to prevent agglomeration. Functionalisation, water based dispersing agents and solvents are provided under collaboration agreement to optimise mixing in resin media.

### **COATINGS AND COMPOSITES**

### Talphene functionalised additives and formulations for revolutionary performance and lower eco-impact



### Pre Treatment and Epoxy Coatings <sup>1</sup>

Increased strength, abrasion resistance and corrosion protection without toxic chrome and metals

#### Packaging Applications <sup>2</sup>

Smart packaging, longer food shelf life and increased recycling

#### Conductive Inks <sup>3</sup>

Superior electrical conductivity, flexibility and cost for printed electronics, sensors and smart labels



Enabling advanced biomedical healthcare products and ship coatings with lower impacts on marine environment

### Carbon Fibre Reinforced Polymers <sup>5</sup>

Improved strength, toughness, weight and conductivity of CFRP to enable metal-free lightning strike and de-icing



Applications: Marine infrastructure and offshore oil & gas production protection, cleaner and lighter automotive and aerospace materials, reducing plastic and decreasing food losses, improving performance of biomedical and solar devices

# **BUILDING MATERIALS**

Talphene admixtures and aggregates for improved strength, thermal and electrical conductivity



#### Admixtures <sup>1</sup>

Improving concrete strength (to 8.2N/mm<sup>2</sup> flexural and 54N/mm<sup>2</sup> compressive) aiding construction with lower weight, better costs and emissions

### Conductive Aggregates <sup>2</sup>

Enabling thermally and electrically conductive materials for smarter construction and new applications, attaining electrical resistance of 0.05 ohm.cm volume



Applications: underground powerline heat dissipation, pipe-free underfloor heating, chemical-free de-iced road-bridge-tarmac areas, static and dynamic wireless charging of electric vehicles

## **▶ SELECTED CURRENT COMMERCIAL PARTNERS**

Talga products are being developed in a range of customer engagements with quality and significant end users



**BillerudKorsnäs,** listed on Nasdaq Stockholm, provides packaging materials and solutions to customers in ~ 100 countries. The company has an annual turnover of about SEK 22 billion



Jaguar Land Rover is a British multinational automotive company and subsidiary of Indian automotive company Tata Motors. Known as JLR they are currently having success with their fully electric EV SUV the I-Pace



**BASF** is the largest chemical producer in the world and operates across 80 countries with nearly 400 production sites. In 2018 BASF generated sales of around €63 billion



The Schunk Group is a large private German based globally operating carbon products and technology group, that have reported turnover in 2017 of about €1.2 billion



**Bosch** is an engineering and industrial technology conglomerate recognised as the world's largest supplier of automotive components. Bosch announced sales revenue in 2016 of ~€73.1 Billion and spent approximately €7 Billion on research and development over the same period



**Johnson Matthey** is a British multinational speciality chemicals and sustainable technologies company, with considerable product range sold into the automotive and battery markets. It is listed on the London Stock Exchange and is a constituent of the FTSE 100 Index

# **CORPORATE OVERVIEW**

#### **DIRECTORS**



**Terry Stinson**Non-Executive Chairman



Mark Thompson

Managing Director



• Grant Mooney

Non-Executive Director

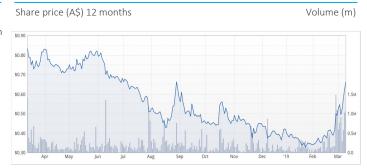


Non-Executive Director



Ola Rinnan
 Non-Executive Director

#### SHARE PRICE PERFORMANCE



#### **MAJOR SHAREHOLDERS**

Smedvig – Scandinavian based family office	11.7%
Mark Thompson – Managing Director	6.5%
HSBC Custody Nominees (Australia)	5.2%
J P Morgan Nominees (Australia)	4.5%
Pelmer Securities	4.2%
Citicorp Nominees	3.7%
Top 20	52.8%

#### FINANCIAL INFORMATION (ASX:TLG)

	<u>,                                      </u>		
Shareholders	~4,100		
Share price	A\$0.665		
52 week low / high	A\$0.325 / A\$0.92		
Shares outstanding <sup>1</sup>	218.2m		
Market Capitalisation	A\$145.1m		
Cash (31-Dec <b>-</b> 2018)	~A\$13.8m		
Debt (31-Dec-2018)	Nil		
Enterprise value	A\$131.3m		

Source: IRESS, company filings. As at 11 March 2019 unless stated otherwise.

<sup>1</sup> Excludes 19.9m unlisted options (mostly employees and directors) with exercise price range up to A\$1.02 and expiry date range 3 May 2019 to 20 Feb 2022.

Primary listing on ASX (code:TLG) with trading in Frankfurt (TGX) and USA (TLGRF)

### **▶ NEXT STEPS**

Talga's large graphite deposits in Sweden represent a strategic European and Global supply opportunity

- **Delivery of the Vittangi project pre-feasibility study** (end of Q1 2019) and lodgment of **permits** to progress to mine and production facility construction
- Accelerated development and marketing of Talnode products, to attract strategic partners and offtake outcomes, and support option to pilot current ore stock into salable products in Q3-4 2019
- Results of battery tests from Talnode developments plus ongoing Faraday Project programs
- Drilling results (Vittangi-Niska) and metallurgy results (Jalkunen-Raitajärvi-Vittangi)
- > Continued **expansion** of European operations, in particular the newly established sales and marketing unit.
- Continued capacity increase and performance optimisation of expanded test facility in Germany for increased graphene product commercial sample production
- Continued exploration and development of non-core battery metals projects, including drilling and evaluation of resource potential, for value-adding in support of higher valuations in various divestment scenarios/attraction of strategic partners.



### **CONTACT US**

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E| info@talgagmbh.com



#### **APPENDIX AND STATEMENTS**

#### **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 Australasian 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 AuslMM.

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 Exploration Targets is based on information compiled and reviewed by Mr Simon Coxhell, a consultant to the Company and a member of the Australian Institute of Mining and Metallurgy and Mr Mark Thompson, who is an employee of the Company and a member of the Australian Institute of Geoscientists. Mr Thompson and Mr Coxhell have sufficient experience which is relevant to the activity which is 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" ("JORC Code"). Mr Thompson and Mr Coxhell consent to the inclusion in the 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 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.

# **GRAPHITE INVENTORY**

#### 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 Resource<sup>1</sup> (5% Cg cut-off)

JORC 2014 Classification	Tonnes	Graphite (%Cg)
Indicated	3,400,000	7.3
Inferred	900,000	6.4
Total	4,300,000	7.1

#### Talga Graphite Exploration Targets <sup>2</sup> 0-100m Depth

Project	Exploration Target	Tonnes (0-100m Vertical Depth)		Graphite (%Cg)	
		Min.	Max.	Min.	Max.
	Nunasvaara	62,400,000	93,600,000	20	30
Vittangi	Kotajärvi	16,640,000	30,160,000	20	25
	Maltosrova	20,800,000	52,000,000	20	25
	Tiankijokki	2,600,000	5,200,000	15	25
Jalkunan	Nybrännan	5,200,000	10,400,000	20	30
Jalkunen	Suinavaara	2,600,000	5,720,000	15	25
	Lautakoski	26,000,000	52,000,000	15	25
	Subtotal	136,240,000	249,080,000	19	27
	Rounded Total	136,000,000	250,000,000	18	25