



# Mkango Resources

Rare Earths from The Warm Heart of Africa

November 2020





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Scientific and technical information contained in this presentation relating to the mineral resource estimate has been approved and verified by Jeremy Witley Pr. Sci Nat of The MSA Group Pty Ltd, who is a “Qualified Person” in accordance with National Instrument 43-101 – Standards of Disclosure for Mineral Projects.

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# Rare Earths Critical for EV Growth

Most important rare earths used in an electric vehicle (EV) are neodymium and praseodymium (NdPr) – used in a permanent magnet electric motor



>90% of EVs use rare earth permanent magnet motors

Each permanent magnet motor uses **0.7kg** NdPr

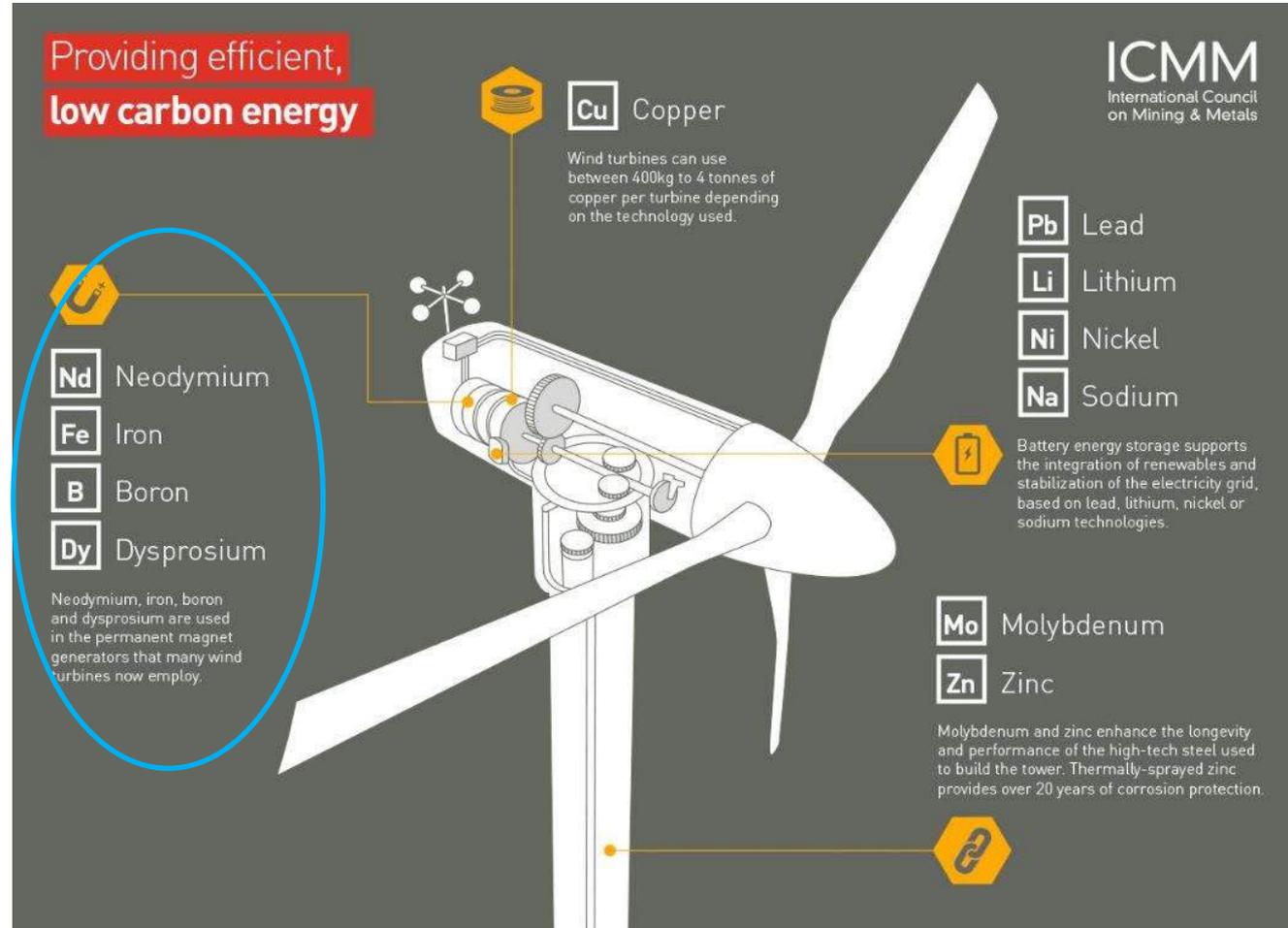
**Rapid rise in EV sales to fuel a 275% increase in demand for rare earths used in EV traction motors between 2019 and 2025**



# Growing Offshore Wind Demand

Each 3MW direct drive wind turbine uses around 1.7 tonnes of NdFeB magnets

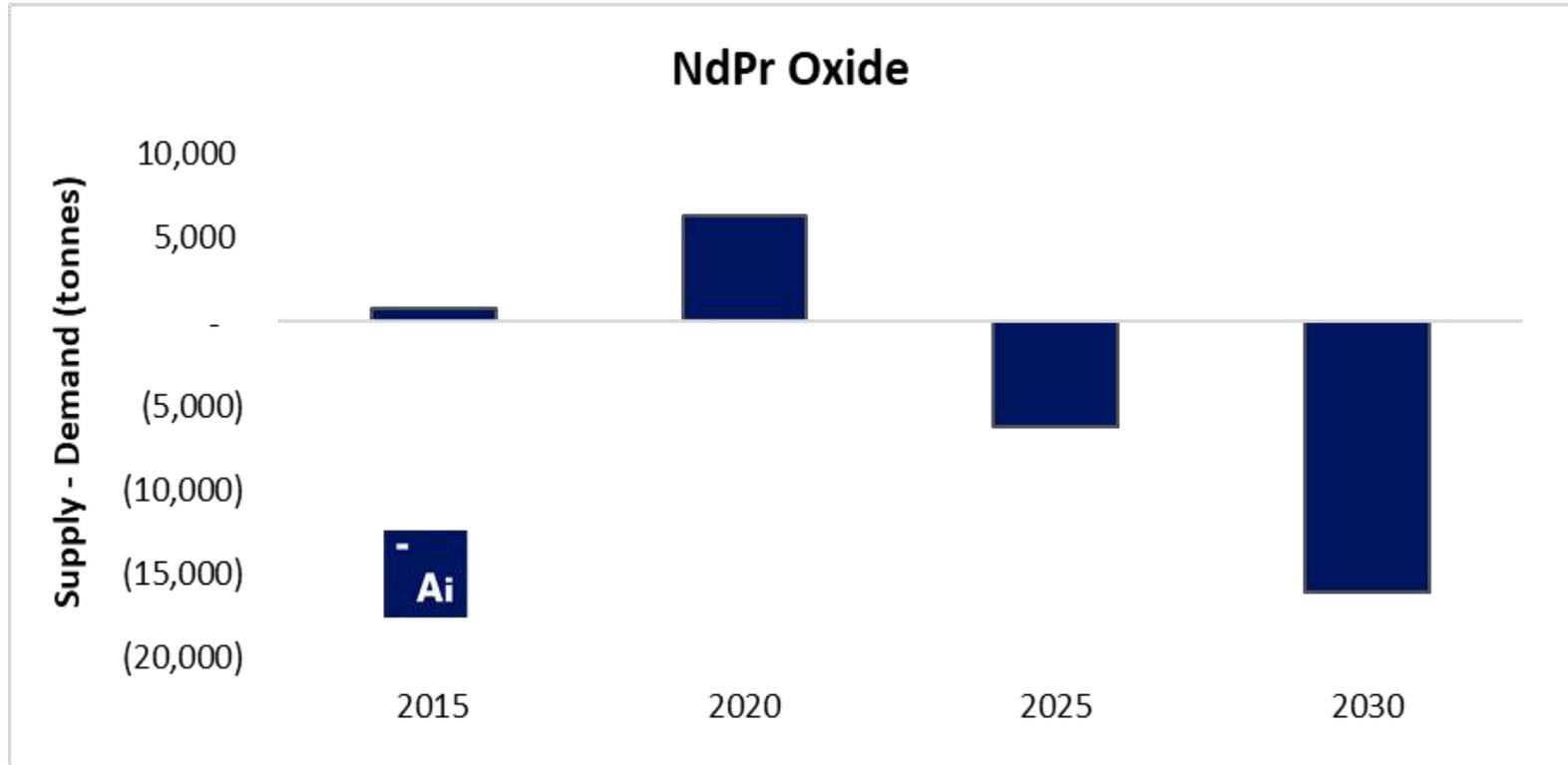
IEA forecasts offshore wind installations will double in next 5 years and grow fivefold by 2030



**Very few advanced stage rare earths projects positioned to meet the demand growth from electric vehicles and wind power**



# Growing Supply - Demand Deficit

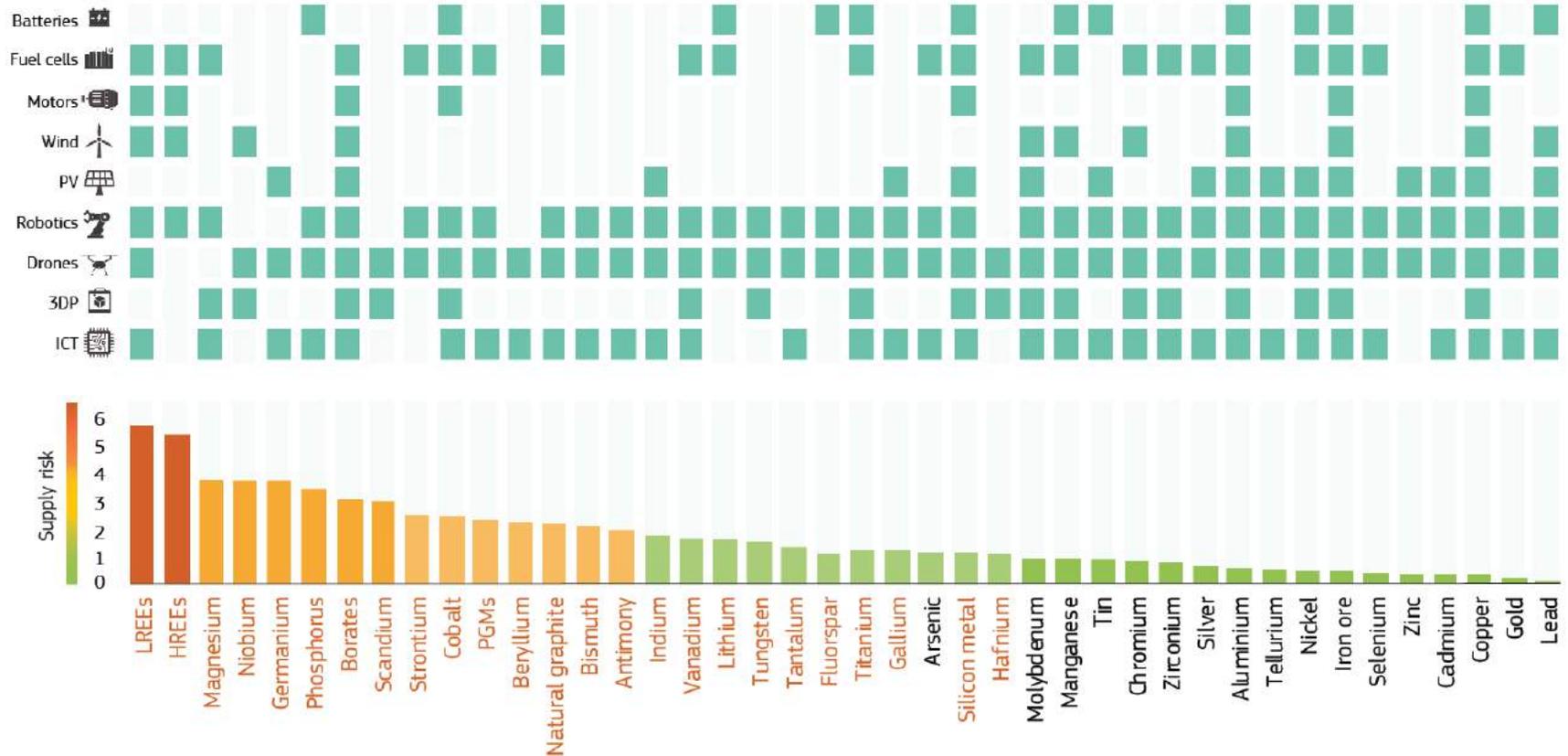


Even with substantial production increases in China and the development of 55,000 tpy new REO production capacity outside China, Adamas Intelligence forecasts a 16,000t NdPr oxide deficit in 2030 – equal to the amount of material needed for production of approximately 20 million EV traction motors



# RE Market Vulnerable to Bottlenecks

## SUPPLY RISK OF RAW MATERIALS FOR KEY TECHNOLOGIES

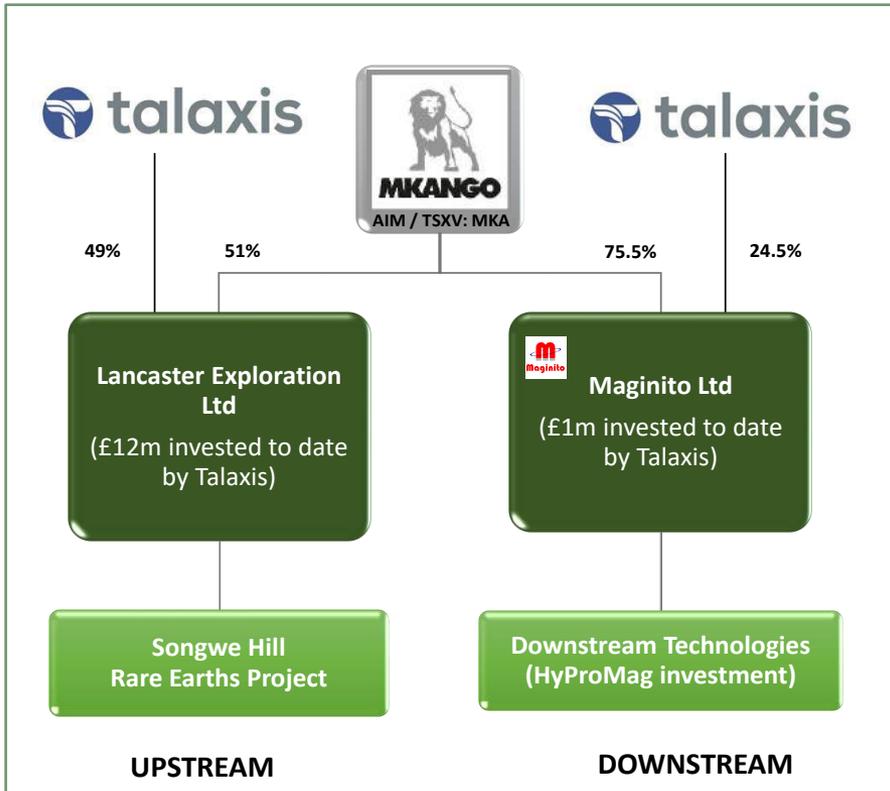


Source: European Commission JRC 2020

Rare earths (LREE & HREE) are highlighted as having the greatest supply risk of raw materials for key technologies



# Mkango Overview



- **Songwe Hill** – advanced stage rare earths project in Malawi, ongoing feasibility study funded by strategic partner, Talaxis Ltd
- **Malawi** – stable jurisdiction with major infrastructure developments
- **ESG** - sustainable development and corporate, social responsibility integral to Mkango’s vision
- **Maginito Ltd** – subsidiary focused on recycling and downstream technologies  
- Strategic interest in HyProMag, focused on rare earth magnet recycling

- **Rare earth separation** – evaluating options for rare earths separation with potential sites identified outside Malawi, site visits undertaken, scoping studies and due diligence underway
- **Extensive exploration portfolio** – recent rutile discovery; uranium, tantalum, niobium, nickel, cobalt
- **Experienced international Board and technically-led executive team** – 12 year track record in Malawi with longstanding relationships with the Government and local communities



# Corporate Snapshot

Listed in Canada (TSX-V) Jan 2011

Dual-listed in UK (AIM) June 2016

Cash position of US\$6.4m June 2020

## Capital Structure (TSX-V / AIM)

Share Price (17/11): £0.098 / C\$0.17

Shares Outstanding: ~133M

Warrants:  
12.0M<sup>1</sup> @ £0.066  
1.2M<sup>2</sup> @ £0.066

Options:  
5.5M @ C\$0.06  
2.4M @ C\$0.07  
0.7M @ C\$0.16  
1.5M @ C\$0.14  
1.7M @ C\$0.11

Fully Diluted: ~158.0M

Market Cap (16/10): ~£13M / C\$23M

<sup>1</sup> Warrants held by Talaxis

<sup>2</sup> Warrants held by Shaun Treacy, Director

## 3 Year Share Price (AIM)



## Major Shareholders

Talaxis (Noble Group)	10.7%
RESOC	10.1%
Leominex <sup>1</sup>	6.4%
Oleg Soloshchanskiy	5.6%
Derek Linfield (Chairman)	3.9%

<sup>1</sup> W Dawes and A Lemon each hold 17.3% of Leominex



# Experienced International Board

**12 year track record in Malawi**

**Technically-led Executive team**

## Longstanding relationships with Government

### **William Dawes - CEO & Co-founder**

- BSc Geology, MSc Mineral Exploration
- Over 25 year's experience in exploration, business development, investment banking
- Prior experience at Rio Tinto, Robert Fleming, Chase Manhattan and JP Morgan

### **Alexander Lemon - President & Co-founder**

- BSc Geological Sciences, MSc Mineral Exploration,
- Over 25 year's experience in exploration, business development, operations management
- Prior experience Allied Commercial, Consolidated Contractors Company

### **Derek Linfield, Non Executive Chairman**

- Former Managing Partner of Stikeman Elliott (London) LLP, >18 years experience in London with African mining and oil & gas sectors
- 

### **Susan Muir, NED**

- Over 30 years Investor Relations experience in the mining sector and in capital markets. Formerly Vice President, IR, at Barrick Gold
- 

### **Shaun Treacy, NED**

- Senior strategic and financial adviser. Chief Investment Officer for PE firm, Arete Capital Partners. Senior investment banking experience with JPMorgan, Lehman Brothers, Nomura and UBS
- 

### **Adrian Reynolds, NED**

- >30 years experience in the natural resources sector; 15 with Randgold, former Chairman of Digby Wells Environmental, NED of Geodrill



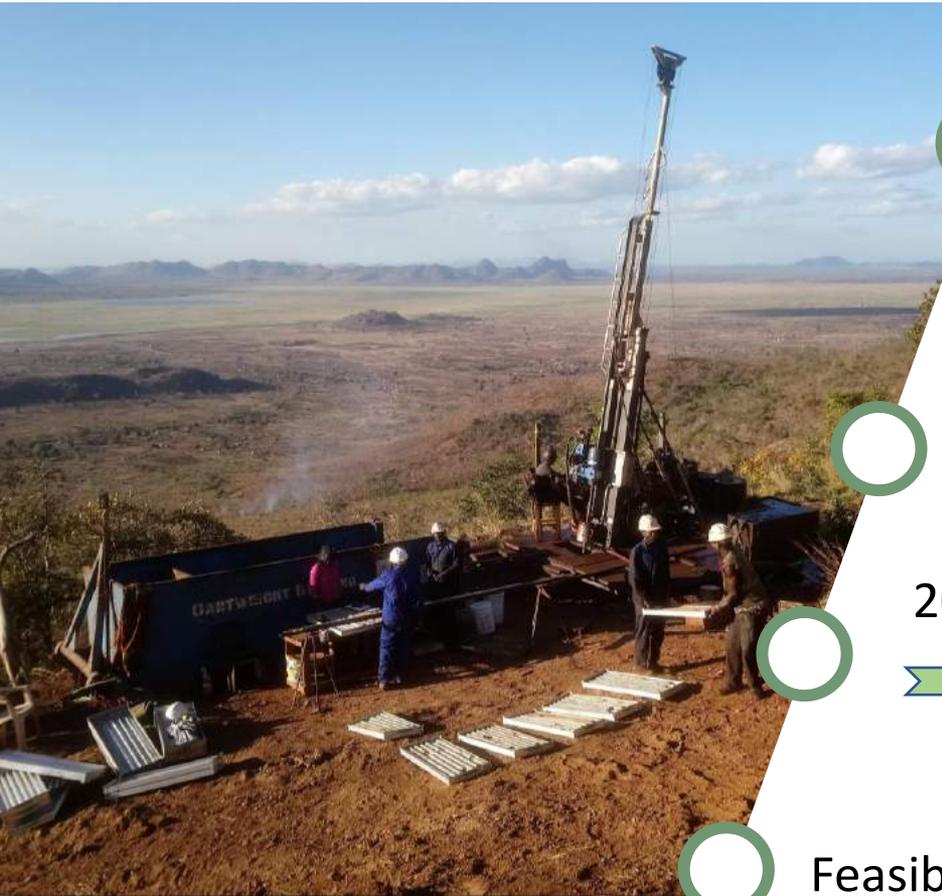
# Strategic Partner – Global Footprint



- Noble Group subsidiary with extensive trading and distribution network throughout Asia and RoW
- Focused on resources critical to green technology supply chains
- Talaxis invested **£12 million** in Songwe for a 49% interest
- Talaxis may increase to 75% of Songwe by financing project development – Mkango retains 25% free carried to production
- Talaxis invested **£1 million** Maginito, for a 24.5% interest - to pursue downstream technology opportunities



# Songwe Hill Rare Earths Deposit



○ Initial Mkango drilling programmes in 2011 and 2012

➔ first resource report prepared in compliance with NI 43-101

○ Pre-feasibility Study completed in 2015

○ 2019 in-fill and step-out drilling programme

➔ 60% increase in Measured and Indicated Resources

○ Feasibility Study underway – targeting completion 2<sup>nd</sup> half 2021

**Broad zones of carbonatite hosted mineralisation  
Fluorocarbonate dominant rare earth mineralogy**

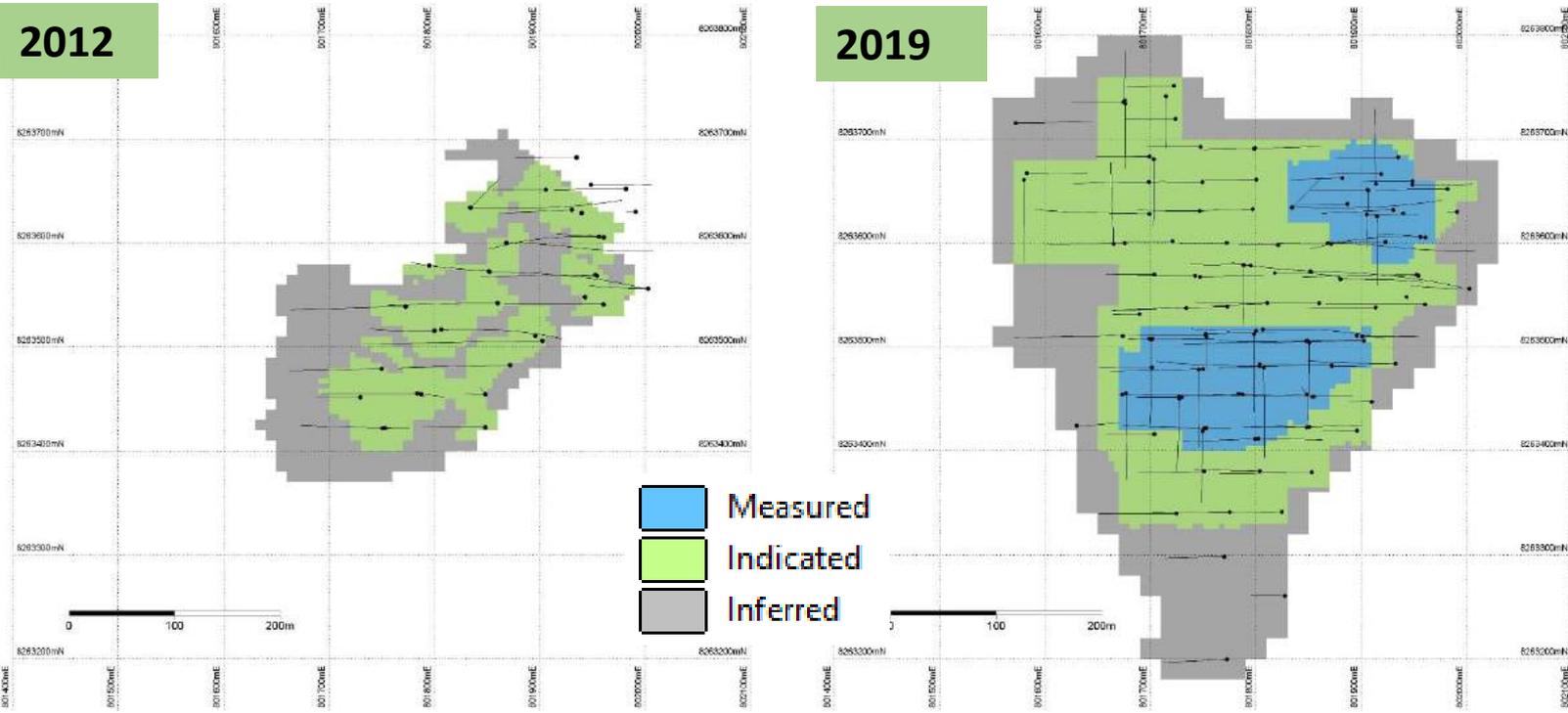


# 2019 Resource Upgrade

## Plan Views

## Pre Feasibility Study

## Ongoing Feasibility Study



**Feasibility study underway, underpinned by 60% larger 2019 Measured and Indicated Resource Estimate**



# Malawi – Favourable Jurisdiction

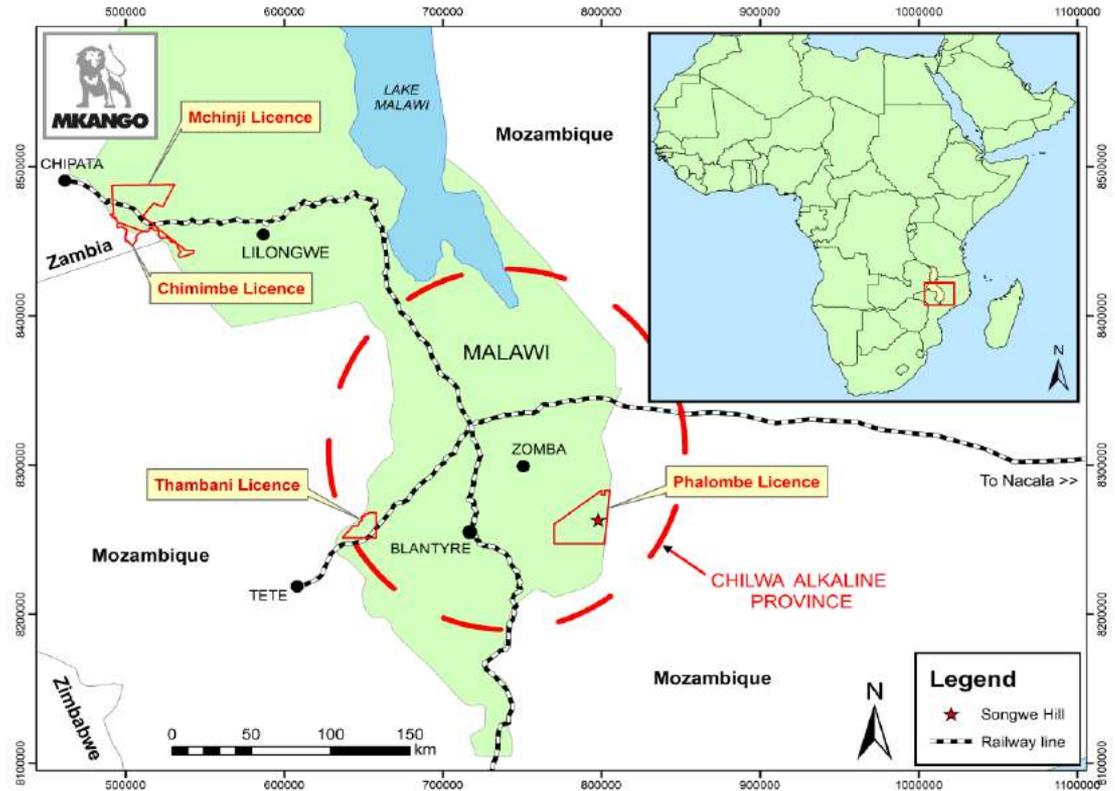
Continuity of senior management since project inception means longstanding relationships with Government and local communities



Minister Hon Gaffar visit



UK High Commissioner Holly Tett

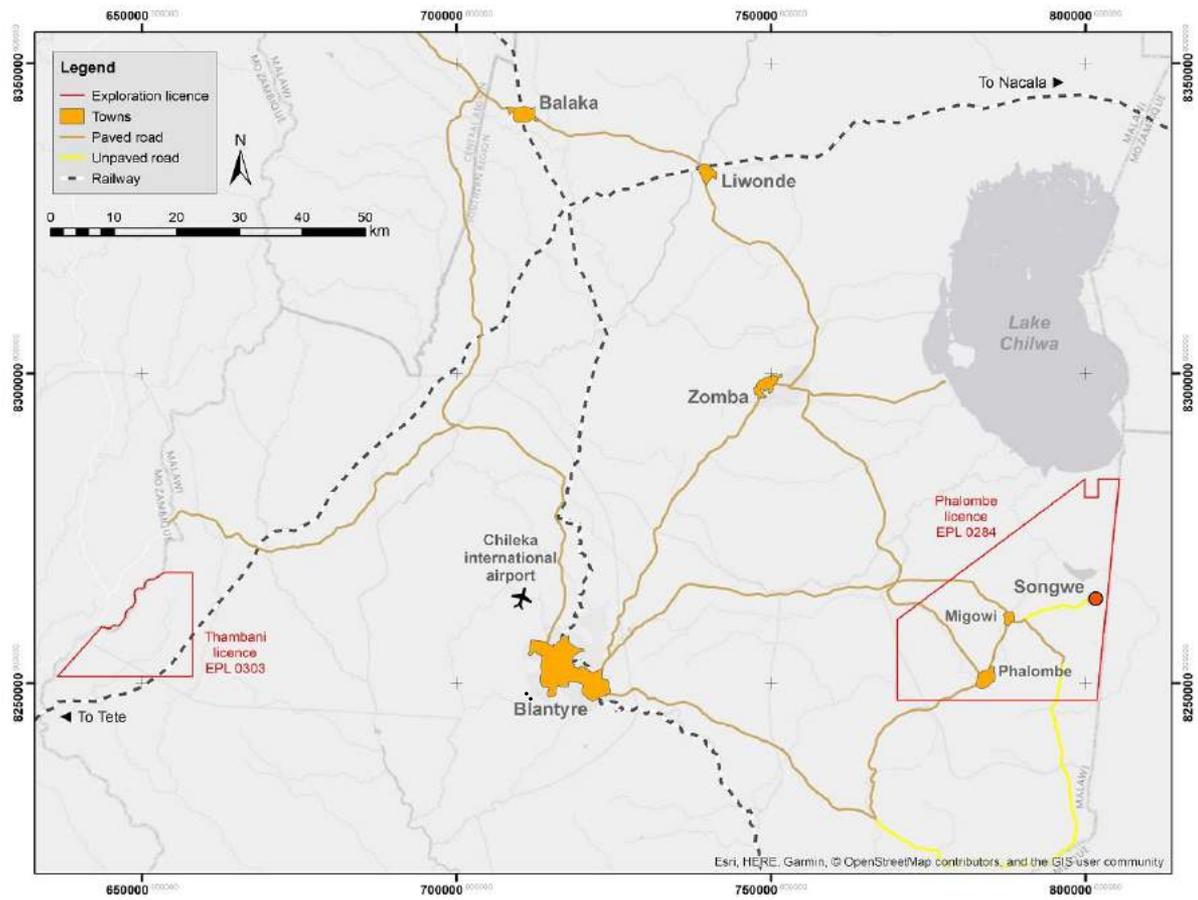


- Supportive Government in emerging mining destination
- Premier African rare earths mineral province
- Infrastructure investment unlocking mineral potential



# Excellent Access to Infrastructure

- Beneficiation, hydromet and acid plants to be located in Malawi
- Production of purified, high grade, mixed rare earth carbonate product
- Product export and reagent import via rail and road
- Major commercial centre, Blantyre, with rail head and international airport just two hours from site
- Power cogenerated from sulphuric acid plant, supplemented with grid and solar





# Sustainably Sourced Rare Earths

- A **high value purified mixed rare earth carbonate product** will be produced at Songwe in Malawi – this will feed a separation plant located outside Malawi with a number of options for separation being evaluated
- The feasibility study envisages **largely renewable power sources** for the mine and processing plants – hydro and solar power developments underway in Malawi
- An **Environmental, Social and Health Impact assessment** is being completed in accordance with Malawian legislation, IFC performance standards and Equator Principles. Corporate Social Responsibility is integral to Mkango's vision in Malawi
- **MWEITI** – Founding member of the Malawi Extractive Industries Transparency initiative
- **REIA** – Founding member of the global Rare Earth Industry Association focused on sustainability, supply chain certification and transparency



# Mkango in the Community

- boNGO Worldwide partnership**  
 Happy Classrooms project  
 Enhancing 3 local primary schools  
 24 classrooms painted with school syllabus

- Scholarships and Food Programme**  
 Secondary education fees paid for the top 6 students from 3 local primary schools – 24 students to date

Zero Hunger with Langar Project – 2,000 primary school students receive daily meal

- Local Community Infrastructure projects**  
 Five water boreholes & pumps installed, fifteen restored in the local area  
 Bridge construction & extensive road refurbishment



Before - An unhappy classroom



After - A happy classroom after renovation & painting syllabus on the classroom wall



Water Pump Mphembezu



New Bridge Constructed

**Sustainable development and corporate social responsibility – integral to Mkango’s vision**





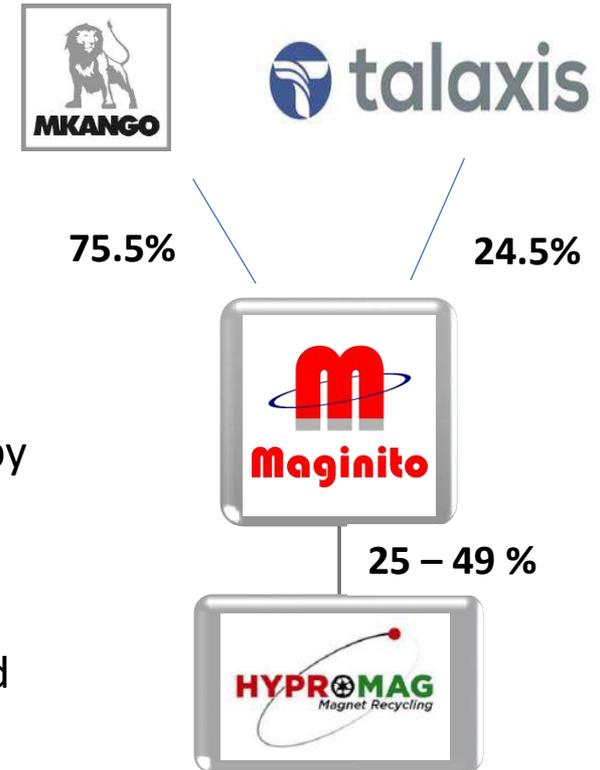
○ Cleantech growth company established by Mkango and Talaxis to pursue downstream technology opportunities in the rare earths supply chain

○ Initial investment in HyProMag completed in January 2020, focused on short loop NdFeB magnet recycling using hydrogen based technology

○ Investment satisfied HyProMag's matched funding requirements for £2.6m Innovate UK grant funded RaRE project announced May 2020, alongside **Bentley, Unipart, Advanced Electrical Machines, Intelligent Lifecycle Solutions, University of Birmingham**

○ Project pipeline under evaluation, including complimentary technologies and further matched funding opportunities

- 25% interest in HyProMag with £1m option to increase to 49% - use of option proceeds to provide matched funding for additional grants
- First right to supply primary sourced rare earths to HyProMag for blending with recycled NdFeB powder
- Offtake and marketing rights for NdFeB powder produced by HyProMag
- Offtake rights for rare earth carbonate and oxides produced by Songwe Hill Rare Earths Project in Malawi



**Mission Statement – focused on building a complimentary portfolio of downstream green technologies, encompassing NdFeB magnet recycling, and new low impact rare earth alloy and separation technologies, underpinned by offtake of sustainably sourced primary and secondary raw materials**

- Maginito has invested £300,000 for an initial 25% interest in HyProMag in addition to a £200,000 convertible loan facility. Option to increase interest to 49%.
- HyProMag has licenced a patented process from University of Birmingham for extracting and demagnetising NdFeB alloy powders from magnets embedded in scrap and redundant equipment (Hydrogen Processing of Magnet Scrap - HPMS)
- The founding directors of HyProMag, comprising Professor Emeritus Rex Harris, Professor Allan Walton and two Honorary Fellows, Dr John Speight and Mr David Kennedy, are leading world experts in the field of rare earth magnetic materials, alloys and hydrogen technology, and have significant industry experience
- Maginito's initial investment of £300,000 will fully satisfy HyProMag's matched funding requirements for the three year, £2.6 million Innovate UK grant funded project, "Rare-Earth Recycling for E-Machines" ("RaRE")



## HPMS – HDD Voice Coil Magnet Assembly



RaRE will for the first time establish an end to end supply chain to incorporate recycled rare earth magnets into electric vehicles - recycled magnets will be built into an ancillary electric motor to ultimately support the development of a commercial ancillary motor suite.

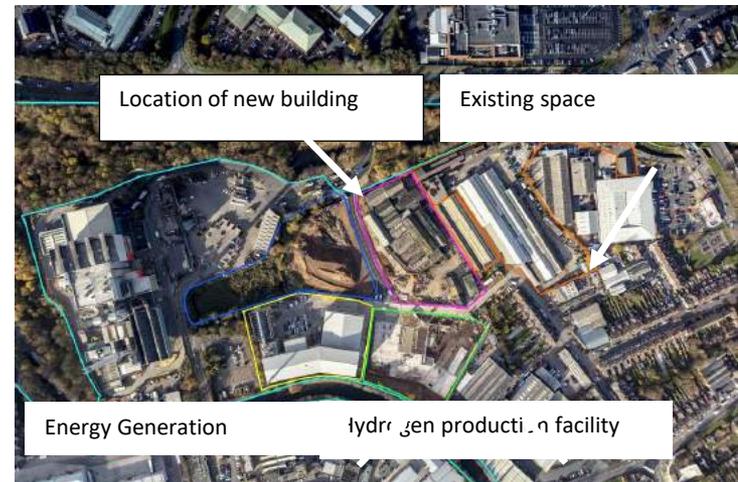
In addition to **HyProMag** and **University of Birmingham**, RaRE features a strong set of partners with complementary expertise:

- **Advanced Electric Machines Research Limited** - extensive experience in designing motors for customers including **Airbus** and **Tevva Motors**
- **Bentley Motors Limited** - an iconic automotive brand and part of the **VW Group**, one of the world's largest car manufacturers
- **Intelligent Lifecycle Solutions Limited** - a global leader in the processing of electronics waste working with Fortune 500 companies and UK government agencies
- **Unipart Powertrain Applications Limited** - one of the largest UK based Tier 1 automotive partners and a recognised volume automotive supplier able to supply globally

- Establishing the manufacture of rare earth magnetic materials at the Tyseley Energy Park, Birmingham UK.
- Evaluating four types of product for potential commercial exploitation:
  - **Hydrogen Decrepitated (HD)** demagnetised powders suitable for magnet producers
  - **Alloy ingot remelted from HD powders.** Suitable for alloy feed or magnet production
  - **Anisotropic alloy powders (HDDR)** for bonded magnets.
  - **Sintered NdFeB magnets** as required by the RaRE project for automotive application



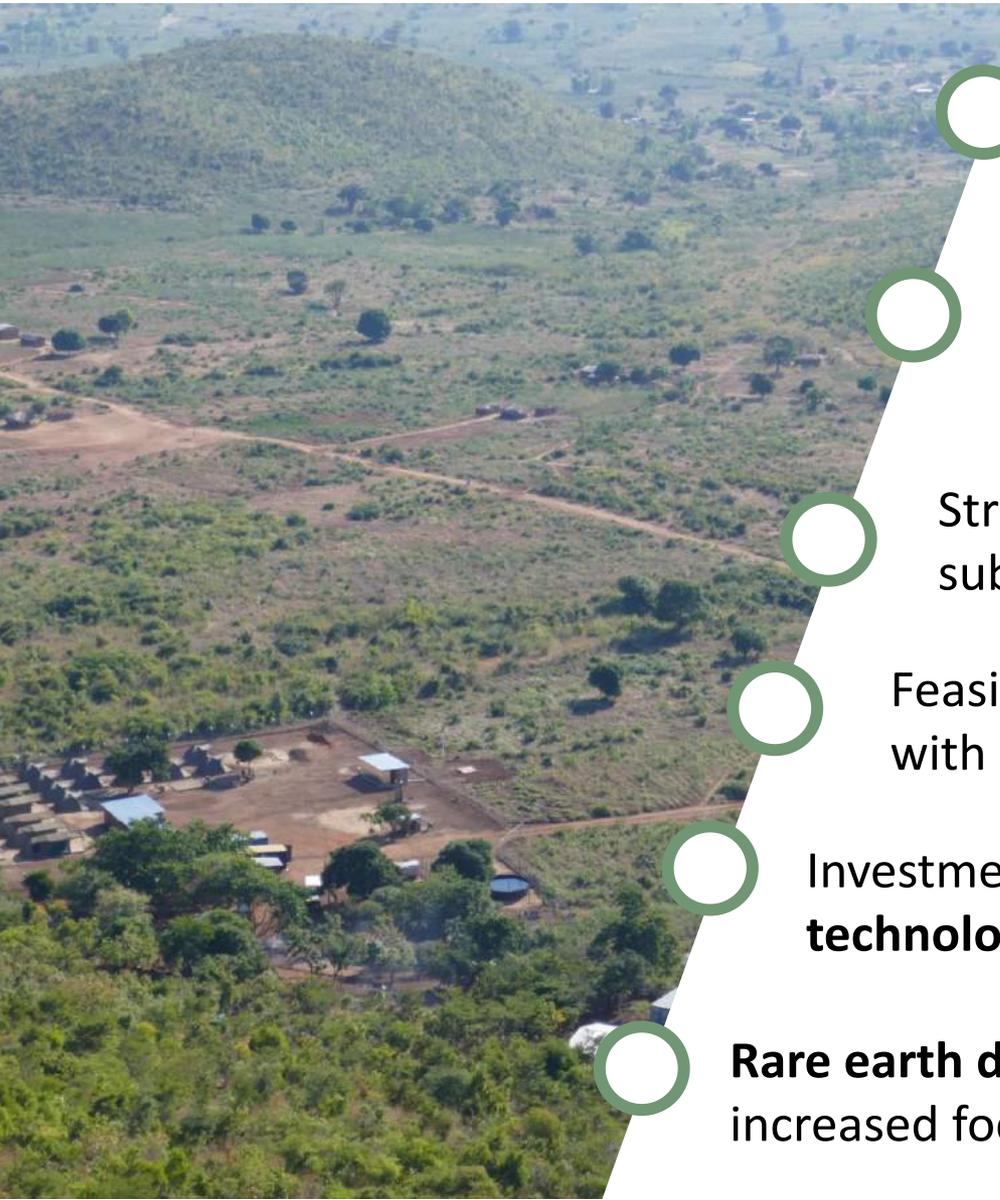
Magnet production facility on UoB campus



Initially based under the umbrella of University of Birmingham process development with phased transfer into Tyseley over two years



# Mkango - Positioned for a Green Future



**Strategically** positioned along the supply chain

One of the very few **advanced stage** rare earth projects outside of China

Strategic **partnership** with Talaxis, a subsidiary of Noble Group

Feasibility study being funded by Talaxis, with **pathway to production**

Investment in complementary **downstream technologies and the circular economy**

**Rare earth demand** driven by clean technology and increased focus on environmental sustainability

[www.mkango.ca](http://www.mkango.ca)

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**Mineral Resources**



# Mineral Resource Estimates

## Mineral Resource estimates at different cut-off grades<sup>1</sup>

Resource Categories	0.5% TREO cut off grade			Base Case 1.0% TREO cut off grade			1.5% TREO cut off grade		
	Million tonnes	TREO %	TREO tonnes	Million tonnes	TREO %	TREO tonnes	Million tonnes	TREO %	TREO tonnes
Measured	13.34	1.26	167,573	8.81	1.50	131,929	3.67	1.86	68,278
Indicated	24.30	1.06	258,092	12.22	1.35	165,469	3.13	1.79	55,805
<b>Total Measured &amp; Indicated</b>	<b>37.64</b>	<b>1.13</b>	<b>425,665</b>	<b>21.03</b>	<b>1.41</b>	<b>297,398</b>	<b>6.80</b>	<b>1.83</b>	<b>124,084</b>
Total Inferred	59.65	1.02	608,194	27.54	1.33	366,154	5.92	1.75	103,414

<sup>1</sup> Mineral resources are not mineral reserves and do not have demonstrated economic viability

### Measured Mineral Resource - Individual Rare Earth Grades at 0.5%, 1.0% and 1.5% TREO Cut-Offs

Cut-Off %TREO	Million Tonnes	La <sub>2</sub> O <sub>3</sub> ppm	CeO <sub>2</sub> ppm	Pr <sub>6</sub> O <sub>11</sub> ppm	Nd <sub>2</sub> O <sub>3</sub> ppm	Sm <sub>2</sub> O <sub>3</sub> ppm	Eu <sub>2</sub> O <sub>3</sub> ppm	Gd <sub>2</sub> O <sub>3</sub> ppm	Tb <sub>4</sub> O <sub>7</sub> ppm	Dy <sub>2</sub> O <sub>3</sub> ppm	Ho <sub>2</sub> O <sub>3</sub> ppm	Er <sub>2</sub> O <sub>3</sub> ppm	Tm <sub>2</sub> O <sub>3</sub> ppm	Yb <sub>2</sub> O <sub>3</sub> ppm	Lu <sub>2</sub> O <sub>3</sub> ppm	Y <sub>2</sub> O <sub>3</sub> ppm	TREO ppm
0.5	13.34	2,948	5,664	602	2,033	301	82	194	24	109	18	42	5	31	4	504	12,560
1	8.81	3,581	6,793	715	2,391	343	94	221	27	124	20	47	6	35	5	572	14,975
1.5	3.67	4,673	8,517	874	2,855	392	107	251	31	140	22	52	7	38	5	631	18,594

### Indicated Mineral Resource - Individual Rare Earth Grades at 0.5%, 1.0% and 1.5% TREO Cut-Offs

Cut-Off %TREO	Million Tonnes	La <sub>2</sub> O <sub>3</sub> ppm	CeO <sub>2</sub> ppm	Pr <sub>6</sub> O <sub>11</sub> ppm	Nd <sub>2</sub> O <sub>3</sub> ppm	Sm <sub>2</sub> O <sub>3</sub> ppm	Eu <sub>2</sub> O <sub>3</sub> ppm	Gd <sub>2</sub> O <sub>3</sub> ppm	Tb <sub>4</sub> O <sub>7</sub> ppm	Dy <sub>2</sub> O <sub>3</sub> ppm	Ho <sub>2</sub> O <sub>3</sub> ppm	Er <sub>2</sub> O <sub>3</sub> ppm	Tm <sub>2</sub> O <sub>3</sub> ppm	Yb <sub>2</sub> O <sub>3</sub> ppm	Lu <sub>2</sub> O <sub>3</sub> ppm	Y <sub>2</sub> O <sub>3</sub> ppm	TREO ppm
0.5	24.30	2,538	4,797	502	1,687	256	69	165	20	90	15	35	4	25	3	415	10,620
1	12.22	3,369	6,195	634	2,083	301	81	191	23	103	16	39	5	28	4	465	13,535
1.5	3.13	4,688	8,279	826	2,637	359	96	224	26	116	18	42	5	30	4	508	17,858

### Inferred Mineral Resource - Individual Rare Earth Grades at 0.5%, 1.0% and 1.5% TREO Cut-Offs

Cut-Off %TREO	Million Tonnes	La <sub>2</sub> O <sub>3</sub> ppm	CeO <sub>2</sub> ppm	Pr <sub>6</sub> O <sub>11</sub> ppm	Nd <sub>2</sub> O <sub>3</sub> ppm	Sm <sub>2</sub> O <sub>3</sub> ppm	Eu <sub>2</sub> O <sub>3</sub> ppm	Gd <sub>2</sub> O <sub>3</sub> ppm	Tb <sub>4</sub> O <sub>7</sub> ppm	Dy <sub>2</sub> O <sub>3</sub> ppm	Ho <sub>2</sub> O <sub>3</sub> ppm	Er <sub>2</sub> O <sub>3</sub> ppm	Tm <sub>2</sub> O <sub>3</sub> ppm	Yb <sub>2</sub> O <sub>3</sub> ppm	Lu <sub>2</sub> O <sub>3</sub> ppm	Y <sub>2</sub> O <sub>3</sub> ppm	TREO ppm
0.5	59.65	2,346	4,601	494	1,691	255	68	159	19	85	14	33	4	25	3	399	10,197
1	27.54	3,189	6,079	639	2,134	306	82	188	22	100	16	39	5	29	4	464	13,296
1.5	5.92	4,375	8,064	825	2,700	368	98	226	27	122	19	47	6	35	5	558	17,475