



# Browns Range Rare Earths

Delivering critical technology  
metals to the world



# Disclaimer



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## Compliance Statement

The information in this presentation that relates to the Mineral Resource Estimates of the Wolverine deposit is extracted from the report entitled "Increased Mineral Resource delivers more good news" dated 23 February 2015 and is available to view on the Company's website ([www.northernminerals.com.au](http://www.northernminerals.com.au)). The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

The information in the announcement that relates to the Mineral Resource Estimates of the Cyclops and Banshee deposits is extracted from the report entitled "Further Increase in Brown Range Mineral Resource" dated 15 October 2014 and is available to view on the Company's website ([www.northernminerals.com.au](http://www.northernminerals.com.au)). The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

The information in the announcement that relates to the Mineral Resource Estimates of the Gambit, Gambit West and Area 5 deposits is extracted from the report entitled "Wolverine Total Resource Doubled in a Major Upgrade of Browns Range HRE Mineral Resource Estimate" dated 26 February 2014 and is available to view on the Company's website ([www.northernminerals.com.au](http://www.northernminerals.com.au)). The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

The information in the announcement that relates to Ore Reserves is extracted from the report entitled Increased Ore Reserve for Browns Range created on 2 March 2015 and is available to view on the Company's website ([northernminerals.com.au](http://northernminerals.com.au)). The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

The information in this report that relates to Exploration Results or Exploration Targets is based on information compiled by Mr Robin Wilson, a full-time employee of Northern Minerals, a Competent Person, who is a member of the Australasian Institute of Mining and Metallurgy. Robin Wilson has sufficient experience which is 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". Mr Wilson consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

The potential quantity and grade of the Exploration Target is conceptual in nature. There has been insufficient exploration completed in the areas of the Exploration Target and it is uncertain if further exploration will result in the estimation of a Mineral Resource.

The information in the announcement that relates to production targets is extracted from the report entitled "DFS positions Browns Range Project as next dysprosium supplier" dated 2 March 2015 and is available to view on the Company's website ([northernminerals.com.au](http://northernminerals.com.au)). The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the production targets in the relevant market announcement continue to apply and have not materially changed.

TREO = Total Rare Earth Oxides -  $\text{La}_2\text{O}_3$ ,  $\text{CeO}_2$ ,  $\text{Pr}_6\text{O}_{11}$ ,  $\text{Nd}_2\text{O}_3$ ,  $\text{Sm}_2\text{O}_3$ ,  $\text{Eu}_2\text{O}_3$ ,  $\text{Gd}_2\text{O}_3$ ,  $\text{Tb}_4\text{O}_7$ ,  $\text{Dy}_2\text{O}_3$ ,  $\text{Ho}_2\text{O}_3$ ,  $\text{Er}_2\text{O}_3$ ,  $\text{Tm}_2\text{O}_3$ ,  $\text{Yb}_2\text{O}_3$ ,  $\text{Lu}_2\text{O}_3$ ,  $\text{Y}_2\text{O}_3$

HREO = Heavy Rare Earth Oxides - Total of  $\text{Sm}_2\text{O}_3$ ,  $\text{Eu}_2\text{O}_3$ ,  $\text{Gd}_2\text{O}_3$ ,  $\text{Tb}_4\text{O}_7$ ,  $\text{Dy}_2\text{O}_3$ ,  $\text{Ho}_2\text{O}_3$ ,  $\text{Er}_2\text{O}_3$ ,  $\text{Tm}_2\text{O}_3$ ,  $\text{Yb}_2\text{O}_3$ ,  $\text{Lu}_2\text{O}_3$ ,  $\text{Y}_2\text{O}_3$

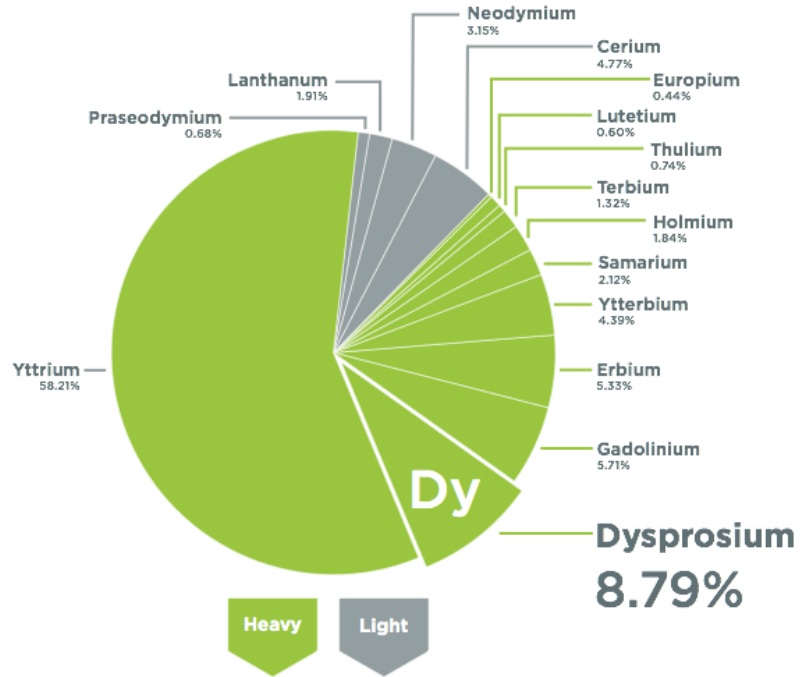


In June 2017, Northern Minerals  
commenced mining at Browns Range.  
In 2018, we will commence new supply  
of heavy rare earths to the market



# Northern Minerals Browns Range

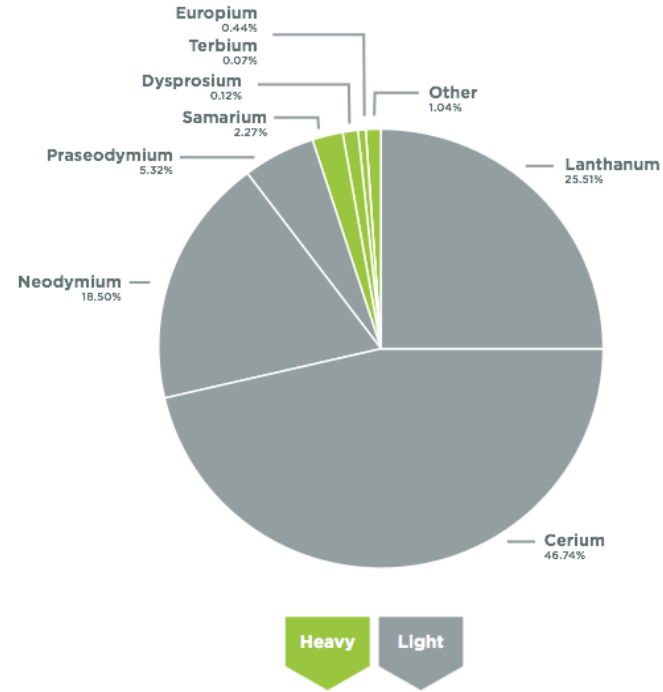
Rare earth distribution <sup>1</sup>



<sup>1</sup> Based on Wolverine Mineral Resource

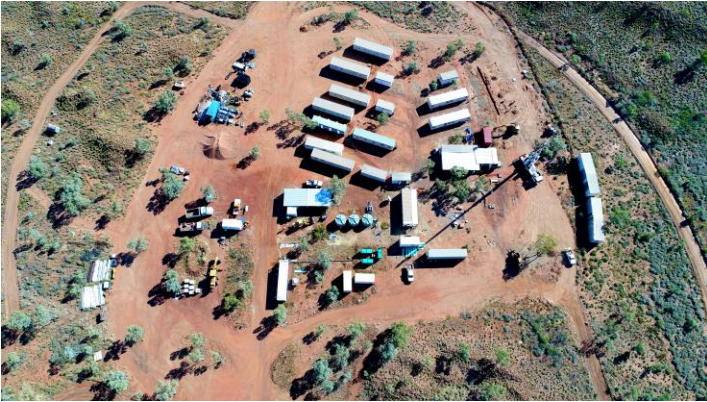
# Lynas Mt Weld

Rare earth oxide composition <sup>2</sup>



<sup>2</sup> Source: Lynas Corporation website

# Browns Range Underway



Browns Range Accommodation Camp



Browns Range Airstrip and Camp



**Powering Technology.** Wolverine – topsoil cleared



Gambit West – mining commenced



# Permanent magnets explained



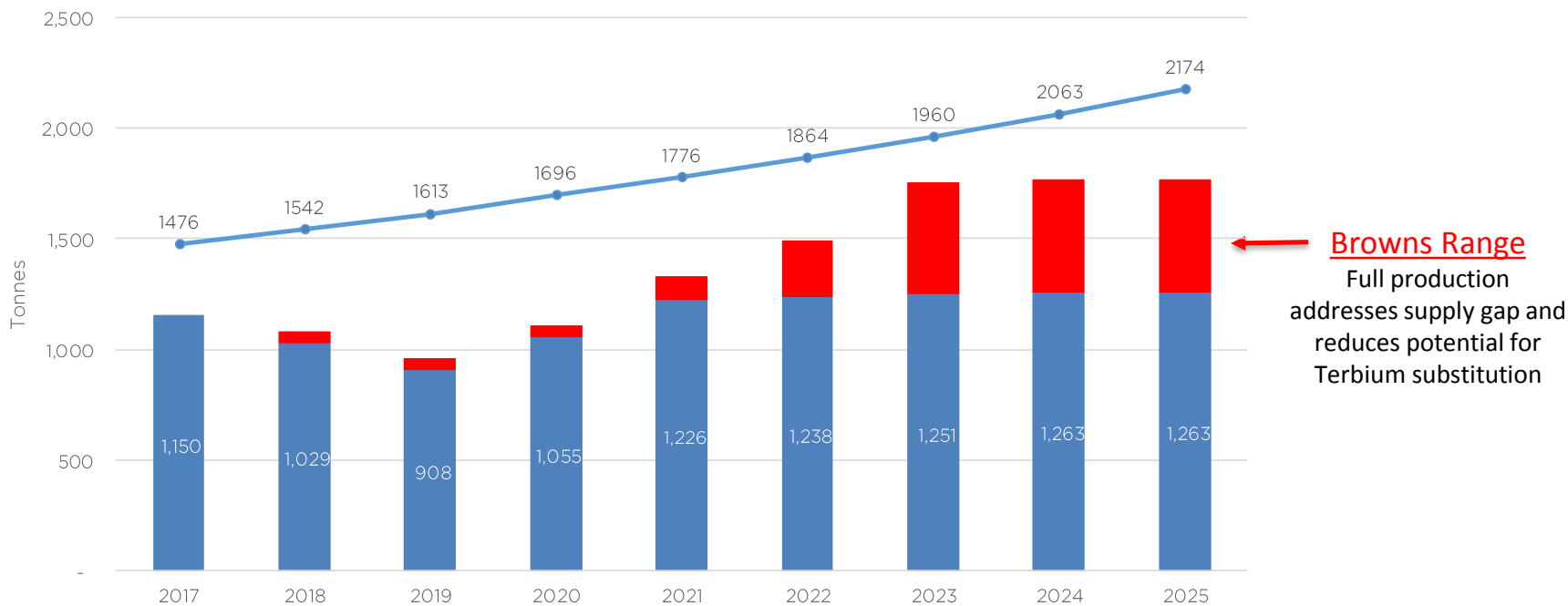
- ◆ NdDyFeB permanent magnets are used by major electric vehicle (EV) and wind turbine makers
- ◆ Dysprosium enhances magnetic properties at higher temperatures
- ◆ Permanent magnets account for 25% of rare earth demand in tonnes and 80% in value
- ◆ UBS has increased forecasts on EV production as a consequence of earlier than expected EV cost parity to internal combustion car production costs
- ◆ Electric vehicle sales expected to grow from 1.2 million in 2015 to >20 million by 2020
- ◆ Alternatives to rare earth magnets have been explored, however timeframe for commercialisation >10 years



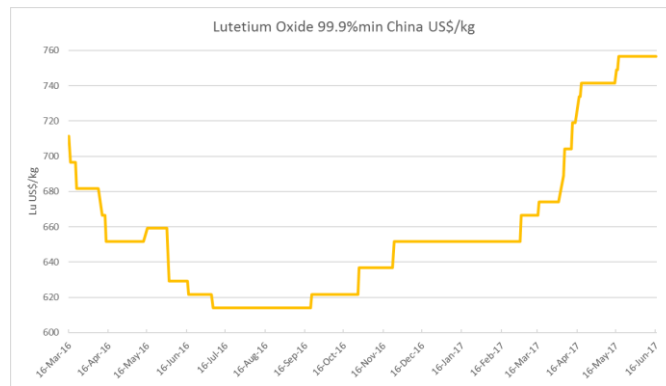
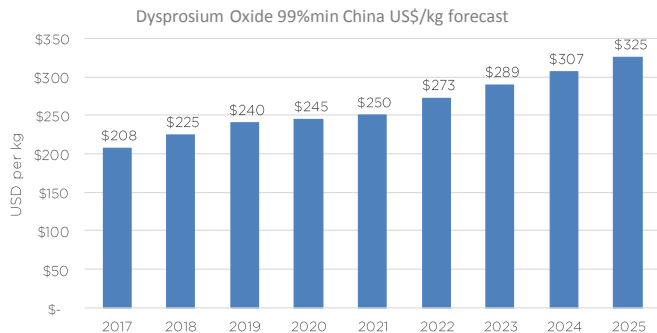
# Chinese carmakers to dominate EV production



# Dy Supply and Demand Dynamics



# Heavy Rare Earth – Sustainable Pricing





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positioned  
for  
success



# Project Location



# Three stage approach to full scale production

## Stage 1

### TEST PILOT PLANT

- 10% of full scale capacity
- Production – July 2018
- Low capital cost
- Develop mining, processing & offtake experience

**COMMENCED**

## Stage 2

### REFINE PROJECT

- Reduce mining cost – modify mining method
- Boost production – increase head grade
- Develop premium product – yttrium rejection
- Increase reserve – drilling

## Stage 3

### BUILD FULL SCALE

- 585,000tpa operation
- 1,500,000kg TREO in a premium product
- Significant dysprosium supplier
- Initial 11 year life with significant upside

measured . sustainable . achievable





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Why a  
continuous  
pilot plant?

# Financing

 Financing

Sales Agreement

Processing Plant

Open Pit Mining

Office & Camp

Tailings Dam

Schedule

Feasibility

- Funding for Pilot Plant Development:
  - \$29.5 million through placements
  - \$32 million via R&D Financing Facility
  - \$14 million through Lind Financing Facility
  - \$11 million via Sinosteel deferred payment\*
  - \$10 million via Sales Agreement pre-payment\*\*

\* Sinosteel MECC has agreed to defer 20% of its contract amount for 24 months, with the ability to convert into Northern Minerals' shares

\*\* JFMAG has agreed to prepay \$10m, with the ability to convert into Northern Minerals' shares



# Sales Agreements Secured



Financing

**Sales Agreement**

Processing Plant

Open Pit Mining

Office & Camp

Tailings Dam

Schedule

Feasibility

- 100% of Browns Range Pilot Plant production to be purchased by a subsidiary of Guangdong Rising Asset Management Limited.
- Agreement with Lianyugang Zeyu New Materials Sales Co Ltd (JFMAG), a 51% owned subsidiary of Guangdong Rare Earths Group.
- The Sales Agreement terms are based off CIF Incoterms 2010 with pricing referenced from a 2-month average of quoted prices on Asian Metals and Beijing Ruidow Information Technology.
- Sales Agreement includes A\$10 million pre-payment, receivable in early 2018 and 40 million unlisted options at \$0.25 exercise price.
- Upon receipt of funds, sales partner representative to join Northern Minerals' Board.



# Quality Sales Partner

Financing

Sales Agreement

Processing Plant

Open Pit Mining

Office & Camp

Tailings Dam

Schedule

Feasibility

Direct shipping route  
from Wyndham or Darwin  
to Lianyungang, China



Powering Technology.

# Pilot Plant Processing Plant

Financing

Sales Agreement

Processing Plant

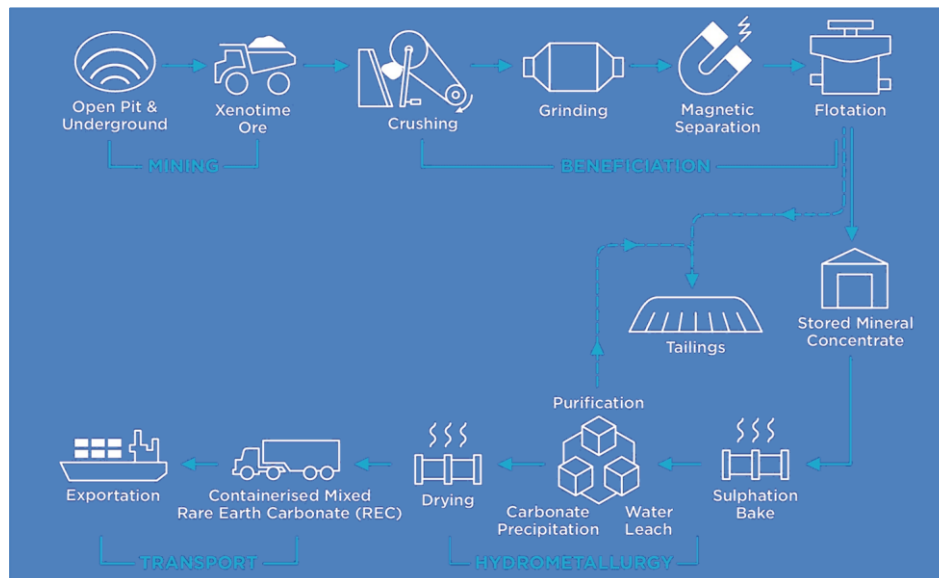
Open Pit Mining

Office & Camp

Tailings Dam

Schedule

Feasibility



**Project Component:**

Modular processing plant

**Contractor:**

Sinosteel MECC

**Annual Production:**

60,000tpa (based on 10 operating months per year)

**Capital Cost:**

A\$39 million

**Status:**

Under construction in China

# Open Pit Mining

Financing

Sales Agreement

Processing Plant

Open Pit Mining

Office & Camp

Tailings Dam

Schedule

Feasibility



**Project Component:**

Open Pit Mining

**Contractor:**

MACA Limited

**Scale:**

180,000t ore mined

**Total Cost:**

A\$6 million

**Status:**

Mining commenced June 2017

Entire mining project to be completed  
in November 2017

# Office and Camp Infrastructure

Financing

Sales Agreement

Processing Plant

Open Pit Mining

Office & Camp

Tailings Dam

Schedule

Feasibility



## Project Component:

Associated infrastructure

## Contractor:

ATCO

## Details:

Camp increased from 21 to 49 personnel  
New office and workshop facilities

## Capital Cost:

A\$1 million

## Status:

Camp extension installed and small  
modifications to complete

# Tailings Dam Construction

Financing

Sales Agreement

Processing Plant

Open Pit Mining

Office & Camp

Tailings Dam

Schedule

Feasibility



## **Project Component:**

Tailings Storage Facility construction

## **Contractor:**

MACA Limited

## **Details:**

Construction of tailings storage facility

## **Capital Cost:**

A\$1.2 million

## **Status:**

Commenced June 2017 using waste material from open pit mining

# Schedule

Financing

Sales Agreement

Processing Plant

Open Pit Mining

Office & Camp

Tailings Dam

	2017									2018					
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Final Investment Decision	✓														
Mining & Bulk Earthworks			✓												
Design & Fabrication		✓													
Installation															
Research & Development															

Schedule

Feasibility

# Feasibility

Financing

Sales Agreement

Processing Plant

Open Pit Mining

Office & Camp

Tailings Dam

Schedule

Feasibility

- The three-year pilot project has been designed to assess the technical and economic feasibility of the proposed full-scale development.
- Key aspects of assessment during the Pilot Plant phase:
  - Mining and ore variability;
  - Flowsheet and recovery optimisation;
  - Water and environmental considerations;
  - Transport and shipping logistics;
  - End user product specifications; and
  - Long term dysprosium market dynamics.
- These determining factors will be incorporated into an updated feasibility study for the proposed full-scale operation.

# Key Personnel and Partners

## Key Site Personnel:

Chris Lee – Resident Manager

Eben Van Rooyen – Project Manager



George Bauk  
Managing  
Director/CEO



Robin Jones  
Chief Operating  
Officer



Bin Cai  
Executive  
Officer



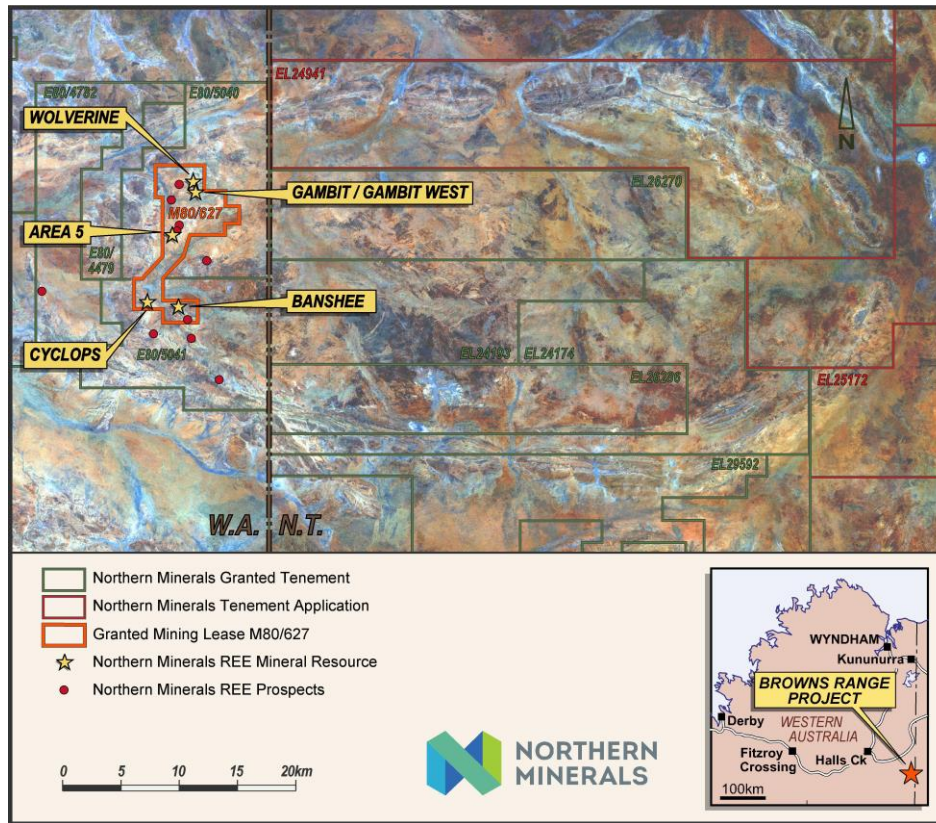
Robin Wilson  
Exploration  
Manager



Mark Tory  
Chief Financial  
Officer

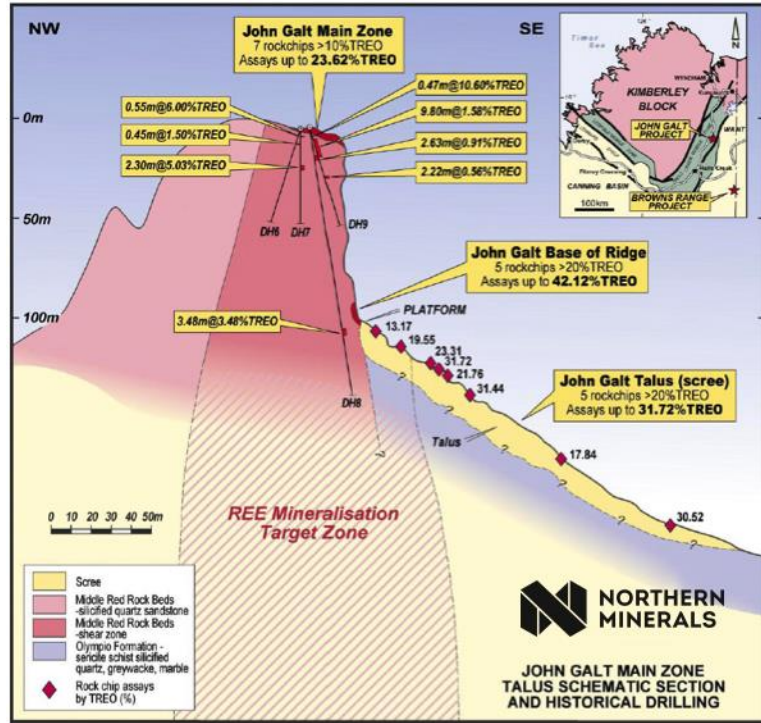


# Browns Range Dome: under explored



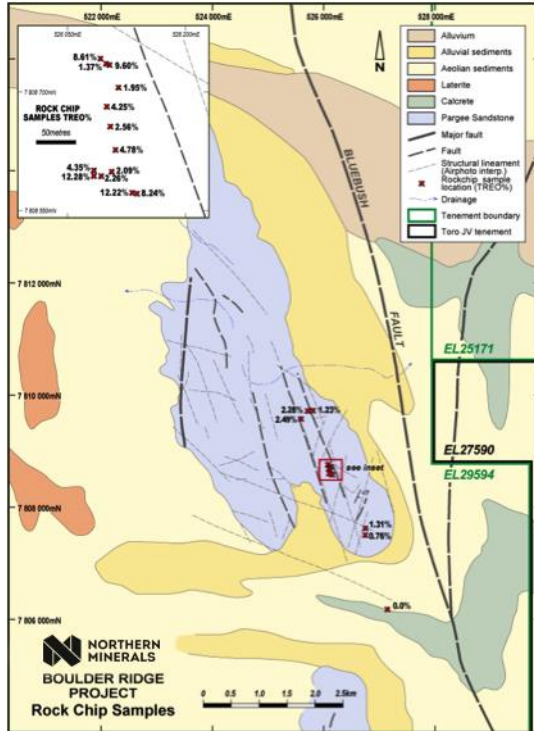
The dome is a massive geological feature covering 1,500km<sup>2</sup> and stretching **60km x 30km** most of which hasn't been effectively explored

# Beyond Browns Range: John Galt



- Rock chip samples up to 42% TREO with approximately 95% Heavy REO
- Preliminary metallurgical tests indicate excellent recovery rates (>90%) with potential for concentrate grades >40%
- High grade mineralisation in talus (scree) material – hard-rock source of scree is the primary target

# Beyond Browns Range: Boulder Ridge



- Rock chip samples from the Boulder Ridge project confirm high-grade Heavy Rare Earths (HRE)
- Best results exceed 12% TREO, including up to 1.15% Dysprosium, with a dominance of HRE – up to 99%.
- Reinforces significant growth potential in Browns Range and Tanami regions.



# 2017 to date....

- Raised \$19.5m at 91% premium
- \$10m placement at 13.5 cents
- \$11m Sinosteel MECC deferred payments
- \$10m JFMAG sales agreement prepayment
- \$14m Lind financing facility signed
- Design completed
- Approved by Board
- Mining and bulk earthworks commenced



# Corporate Overview

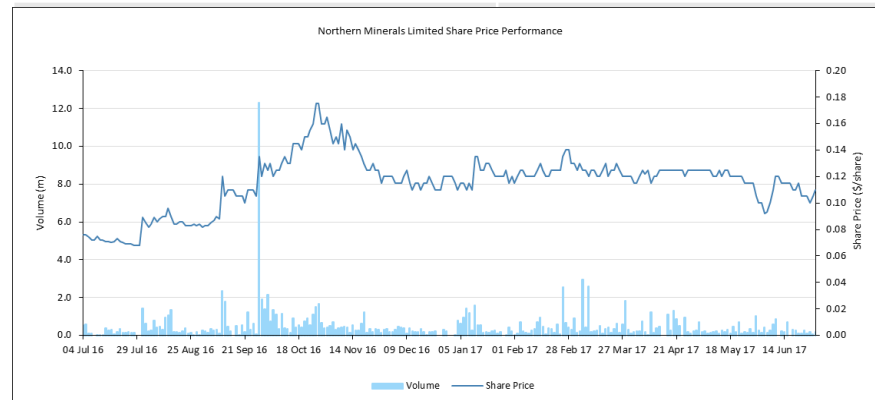


Major shareholders	31 May 2017
Australian Conglin International Investment Group	28.6%
Huatai Mining	21.9%
Jien Mining	3.9%
Board & Management	2.6%
Remaining Top 20	17.5%
Other	25.5%

## Market capitalisation \$78M

(at 30 June 2017 @ \$0.11)

Ordinary Shares	709M
Options and Performance Rights	70.7M
Cash (30 June 2017)	\$8.5M





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# Northern Minerals: Building an Australian greenfields discovery



# Appendices



# Dysprosium is a critical technology metal



## ➤ Rare Earths

➤ Dysprosium

➤ Terbium

➤ Neodymium

➤ Praseodymium

➤ Lithium

➤ Graphite

➤ Cobalt

➤ Nickel



# Mineral Resources

Deposit	Category	Mt	TREO	Dy <sub>2</sub> O <sub>3</sub>	Y <sub>2</sub> O <sub>3</sub>	Tb <sub>4</sub> O <sub>7</sub>	HREO	TREO
			%	Kg/t	Kg/t	Kg/t	%	Kg
<b>Wolverine</b>	Indicated	2.99	0.83	0.73	4.86	0.11	89	24,952,000
	Inferred	1.97	0.89	0.76	5.13	0.11	88	17,609,000
	<b>Total<sup>1</sup></b>	<b>4.97</b>	<b>0.86</b>	<b>0.74</b>	<b>4.97</b>	<b>0.11</b>	<b>89</b>	<b>42,560,000</b>
<b>Gambit West</b>	Indicated	0.27	1.26	1.07	7.06	0.14	90	3,424,000
	Inferred	0.12	0.64	0.54	3.67	0.07	85	753,000
	<b>Total<sup>1</sup></b>	<b>0.39</b>	<b>1.07</b>	<b>0.91</b>	<b>6.04</b>	<b>0.12</b>	<b>89</b>	<b>4,177,000</b>
<b>Gambit</b>	Indicated	0.05	1.06	0.92	6.62	0.12	97	533,000
	Inferred	0.06	1.2	1.01	6.8	0.15	95	671,000
	<b>Total<sup>1</sup></b>	<b>0.11</b>	<b>1.13</b>	<b>0.97</b>	<b>6.72</b>	<b>0.13</b>	<b>96</b>	<b>1,204,000</b>
<b>Area 5</b>	Indicated	1.38	0.29	0.18	1.27	0.03	69	3,953,000
	Inferred	0.14	0.27	0.17	1.17	0.03	70	394,000
	<b>Total<sup>1</sup></b>	<b>1.52</b>	<b>0.29</b>	<b>0.18</b>	<b>1.26</b>	<b>0.03</b>	<b>69</b>	<b>4,347,000</b>
<b>Cyclops</b>	Indicated	-	-	-	-	-	-	-
	Inferred	0.33	0.27	0.18	1.24	0.03	70	891,000
	<b>Total<sup>1</sup></b>	<b>0.33</b>	<b>0.27</b>	<b>0.18</b>	<b>1.24</b>	<b>0.03</b>	<b>70</b>	<b>891,000</b>
<b>Banshee</b>	Indicated	-	-	-	-	-	-	-
	Inferred	1.66	0.21	0.16	1.17	0.02	87	3,484,000
	<b>Total<sup>1</sup></b>	<b>1.66</b>	<b>0.21</b>	<b>0.16</b>	<b>1.17</b>	<b>0.02</b>	<b>87</b>	<b>3,484,000</b>
<b>Total<sup>1</sup></b>	Indicated	4.69	0.70	0.59	3.95	0.09	87	32,862,000
	Inferred	4.28	0.56	0.46	3.15	0.07	87	23,802,000
	<b>Total<sup>1</sup></b>	<b>8.98</b>	<b>0.63</b>	<b>0.53</b>	<b>3.56</b>	<b>0.08</b>	<b>87</b>	<b>56,663,000</b>

# Ore Reserves

Deposit	Classification	Ore Tonnes	TREO		Dy <sub>2</sub> O <sub>3</sub>		Tb <sub>4</sub> O <sub>7</sub>		Y <sub>2</sub> O <sub>3</sub>	
			kg/t	kg Contained	kg/t	kg Contained	kg/t	kg Contained	kg/t	kg Contained
OPEN PIT										
Wolverine	Probable	833,000	6.15	5,124,000	0.55	460,000	0.08	66,000	3.59	2,989,000
Gambit West	Probable	219,000	10.10	2,212,000	0.83	182,000	0.11	25,000	5.52	1,209,000
Gambit	Probable	37,000	8.05	298,000	0.68	25,000	0.09	3,000	4.74	176,000
Area 5	Probable	467,000	2.24	1,048,000	0.14	65,000	0.02	10,000	0.99	463,000
UNDERGROUND										
Wolverine	Probable	2,104,000	8.00	16,833,000	0.70	1,483,000	0.10	221,000	4.71	9,908,000
Gambit West	Probable	90,000	9.54	860,000	0.88	79,000	0.11	10,000	5.78	521,000
RESERVE										
Total	Probable <sup>1</sup>	3,750,000	7.03	26,375,000	0.61	2,294,000	0.09	335,000	4.07	15,266,000

<sup>1</sup> Rounding may cause some computational discrepancies

# Pilot plant: targeted production

- Mixed RE carbonate (REC) produced
- Product specification available for REC
- REC samples validated by several downstream separators
- REC suitable for solvent extraction separation
- Low thorium and uranium levels

REO contained in mixed RE carbonate	Annual production (000s kgs)
Lanthanum	5.8
Cerium	15.2
Praseodymium	2.8
Neodymium	10.6
Samarium	11.4
Europium	2.4
Gadolinium	34.8
Terbium	6.7
Dysprosium	49.4
Holmium	13.5
Erbium	39.3
Thulium	5.6
Ytterbium	33.1
Lutetium	4.5
Yttrium	337.6
<b>Total TREO produced</b>	<b>573</b>

Figures may not add due to rounding  
 TREO = Total Rare Earth Oxides- Total of Dy<sub>2</sub>O<sub>3</sub>, 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>, 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>, Y<sub>2</sub>O<sub>3</sub>

# NTU Board



## **Colin McCavana - Non-executive Chairman**

Mr McCavana has more than 35 years of management experience worldwide in the earthworks, construction and mining industries.

## **George Bauk - Managing Director / CEO**

George is an experienced executive, with over 25 years' experience in the resources industry. Prior to Northern Minerals, George held global operational and corporate roles with WMC Resources, Arafura Resources and Indago Resources.

## **Adrian Griffin - Non-executive Director**

An Australian trained mining professional with exposure to metal mining and processing throughout the world, Mr Griffin has been involved in the development of extraction technology for platinum group metals and agricultural commodities.

## **Nan Yang - Non-executive Director**

Mr Yang is an Australian mining engineer with more than 10 years' experience in mine planning, design, and mergers and acquisitions.

## **Yanchung Wang - Non-executive Director (not in photo)**

Ms Wang acts as a strategic investor for a number of Chinese based companies. Ms Wang is Vice Chairman of Conglin Baoyuan International Investment Group and also a Director of Huachen. Mr Bin Cai (pictured) is an alternative director for Ms Wang.

# Executive Team



**George Bauk**  
**Managing Director / CEO**

George is an experienced executive, with over 25 years' experience in the resources industry. Prior to Northern Minerals, George held global operational and corporate roles with WMC Resources, Arafura Resources and Indago Resources.



**Mark Tory**  
**Chief Financial Officer**

Mark is a Chartered Accountant with 25 years of professional experience in the mining industry and accounting professions. Prior to Northern Minerals, Mark held senior positions at Crescent Gold Limited, Anglo American Exploration and Homestake Gold (now Barrick Gold).



**Robin Jones**  
**Chief Operating Officer**

Robin has more than 20 years experience in the mining industry, the majority of which has been in the assessment and development of resource projects from scoping study level through to operation. Robin has held senior management positions in PGM, nickel, copper, gold and uranium projects in Australia, South Africa and China.



**Robin Wilson**  
**Exploration Manager**

Robin has held senior exploration positions in several exploration and mining companies, including Polaris Metals, Tanganyika Gold, Troy Resources and CRA Exploration. In addition, he spent 5 years working in oil and gas exploration for Woodside Energy.



**Bin Cai**  
**Executive Officer**

Bin is the MD of Conglin International Investment Group Pty Ltd based in Brisbane. He has a record of successful strategic investments in emerging Australian resources companies based on his long experience in resources investment.



# The Northern Minerals SPIRIT

