



**ASX  
NTU**



**NORTHERN  
MINERALS**

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**Heavy Rare Earths Producer**  
September 2018

**Presented by  
George Bauk**

## Disclaimer

This presentation has been prepared by Northern Minerals Limited (“Northern Minerals” or the “Company”). It should not be considered as an offer or invitation to subscribe for or purchase any securities in the Company or as an inducement to make an offer or invitation with respect to those securities. No agreement to subscribe for securities in the Company will be entered into on the basis of this presentation.

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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 – 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>, Dy<sub>2</sub>O<sub>3</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>

HREO = Heavy Rare Earth Oxides – Total of 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>, Dy<sub>2</sub>O<sub>3</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>

# Value proposition

01

## Globally significant

Browns Range is the only non-Chinese producer of dysprosium

04

## Enhancement initiatives

Several projects underway, including ore sorting, to increase value

02

## Electric vehicle growth

Dysprosium is a key ingredient in permanent magnets used in EVs

05

## Exploration upside

New discoveries at Dazzler & Iceman point to improved economics

03

## In production

Commissioning has commenced and xenotime concentrate produced

06

## Stable investment jurisdiction

First world economy, infrastructure, environmental and work practices

## Corporate leadership

**Our people** embody the Northern Minerals SPIRIT, a culture of continually striving to deliver exceptional outcomes, leadership and improvements.

01

### George Bauk, MD/CEO

Since 2010, George has lead the team from initial discovery to production

03

### Robin Wilson, Expl. Mgr

Original Browns Range discoverer, on the hunt for new resources

02

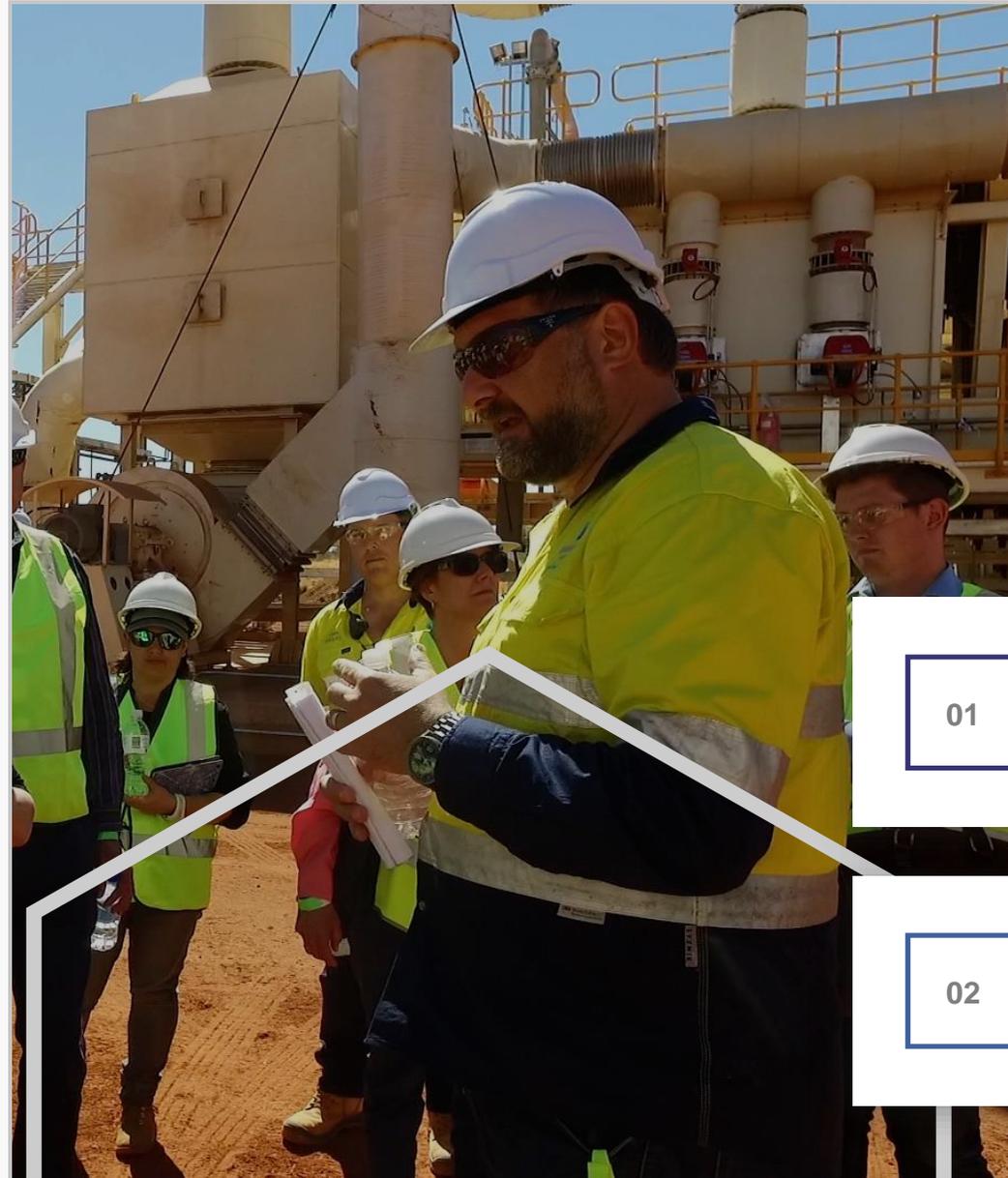
### Mark Tory, CFO

Specialist in innovative finance and capital management

04

### Bin Cai, Executive Officer

Strong Chinese connections, critical for finance, construction & offtake





## Operational leadership

**Our team of operational specialists** have years of experience in the discovery, production and marketing of rare earths. Having experts in their fields allows us to maximise value for shareholders.

01

**Robin Jones, COO**

Driven Browns Range to be the newest dysprosium producer

03

**Eben Van Rooyen – Res. Mgr**

Charged with building Browns Range as a new greenfields site

02

**Tony Hadley, General Manager**

Experienced rare earths operator, focused on delivering results

04

**Louis de Klerk, R&D Mgr**

Focus on R&D, continuous improvement & assessment against benchmarks

# Browns Range Project

In **September 2018**, Northern Minerals became the only non-Chinese producer of dysprosium with the commissioning of the three-year Pilot Plant Project, aimed at assessing the technical and economic feasibility of the full-scale operation.



## **\$67m Capital Development**

Three-year project producing 3,300 tonnes of heavy rare earth carbonate



## **Dysprosium & Terbium**

Key heavy rare earth value drivers



## Dy – critical to the EV evolution

With each electric vehicle using just over 100g of dysprosium, demand is expected to increase to over 3,500tpa by 2030. With over 98% of Dy production from China, there is strong interest in the US and globally for new, sustainable sources of supply.



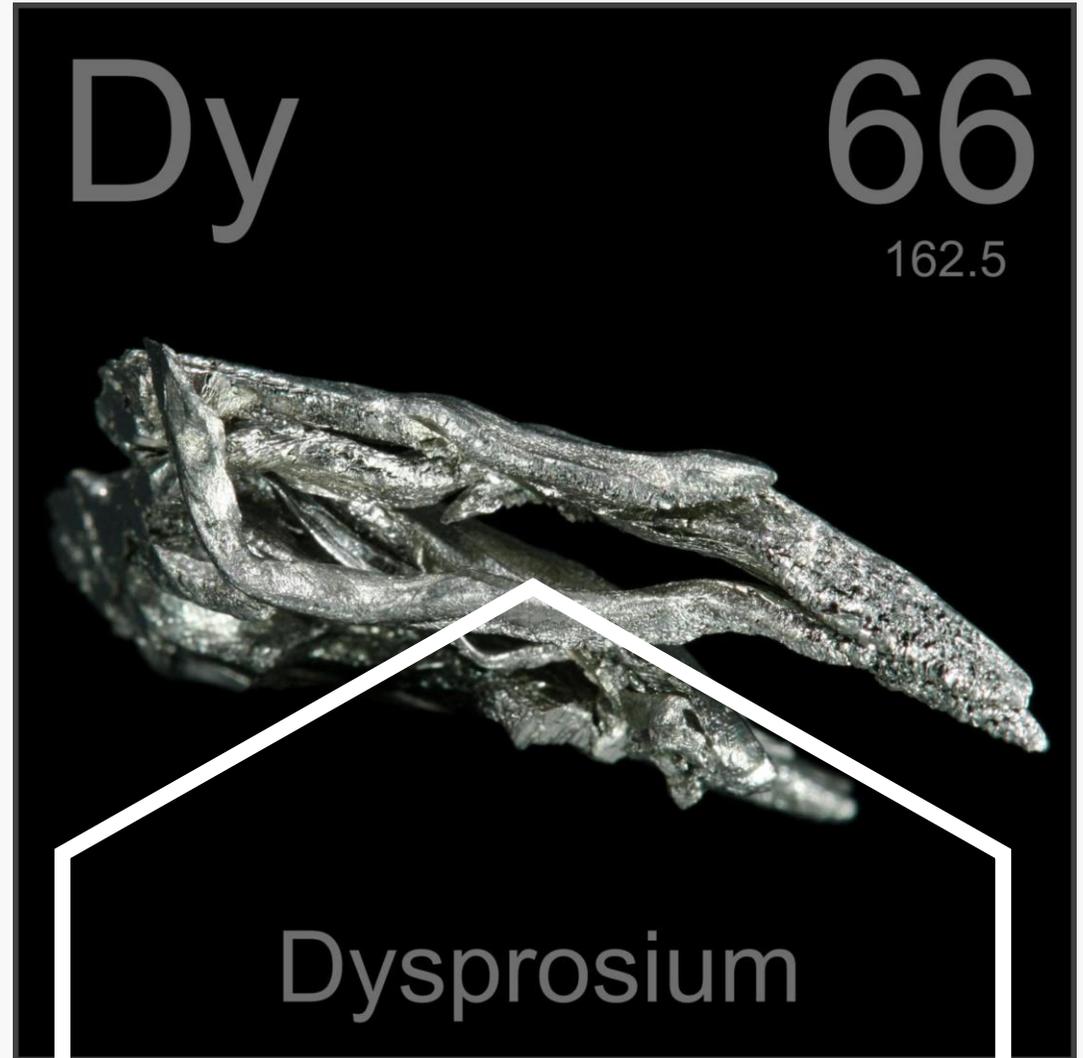
### Chinese dominance

State controlled production from largely dirty in situ leach deposits



### US critical alert

Trump Government identified rare earths as critical to US economic growth



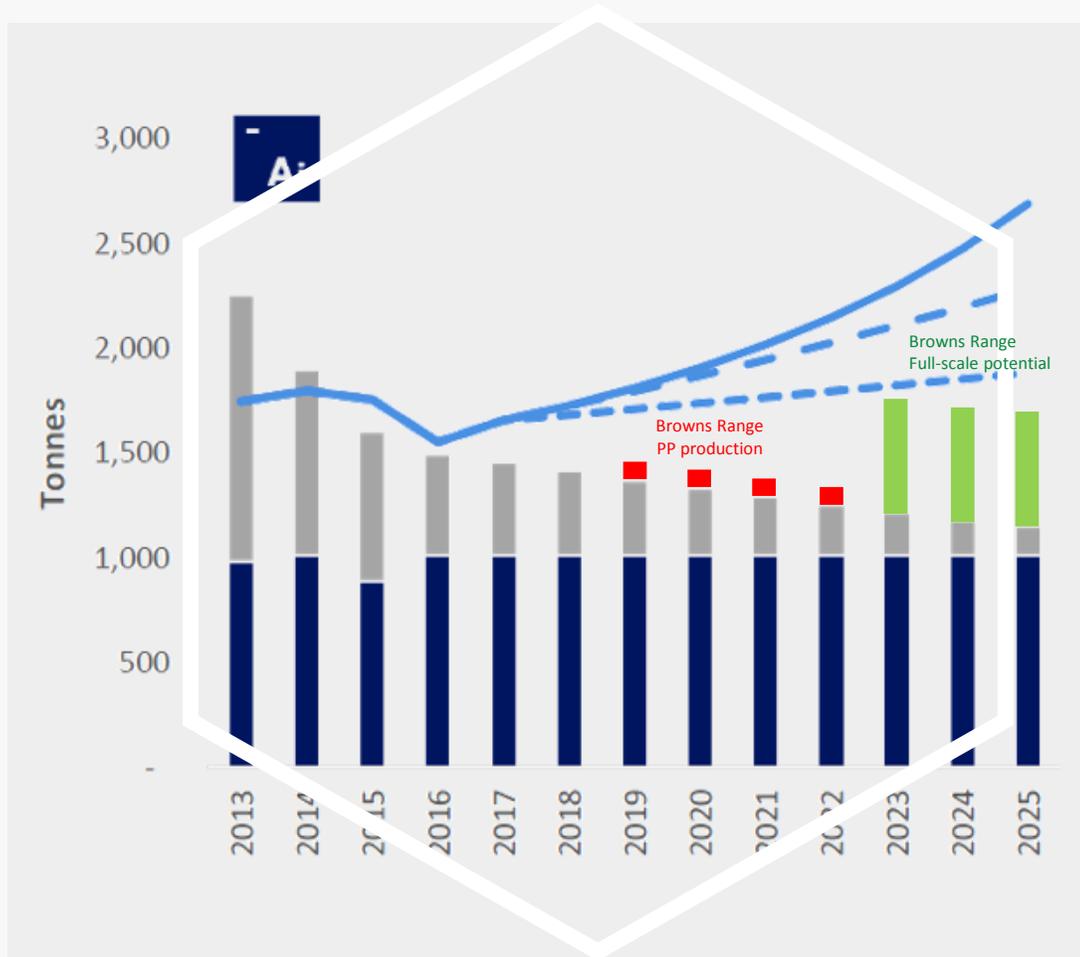


# Australian Dysprosium

**The Pilot Plant Project** incorporates a beneficiation plant and hydrometallurgical circuit, producing heavy rare earth carbonate.

All nameplate offtake for the Pilot Plant Project has been committed to Lianyugang New materials Sales Co Ltd (JFMAG), a 51% owned subsidiary of Guangdong Rare Earths Group.

Additional production above the nameplate capacity is not committed and available for offtake.



## Filling the supply gap

**Chinese illegal production** is expected to continue falling as the Government cracks down. Even with efficiencies in electric motors, the supply/demand gap is expected to continue widening.



# Browns Range flowsheet



Magnetic  
Separation

Dryer

Kiln

Water leach

Xenotime  
Concentrate  
Stockpile

Ore  
Stockpile

Rare Earth  
Carbonate  
Bagging

Crusher

Ball mill

Flotation

Tails

CCD

Purification

# Staged development plan

01

## Test Pilot Plant

Mine xenotime ore  
Produce mixed RE carbonate  
Export to offtake customers

02

## Refine Project

Validate & refine flowsheet  
Implement ore sorting  
Improve xenotime conc. grade  
Investigate plant efficiencies

03

## Downstream Enhancements

Product separation  
Satellite deposits  
New RE revenue streams

04

## Develop Full Project

Economies of scale  
New customer base  
Global disruption to supply

05

## Accelerate Exploration

Increased mine life  
Improve head grade targeting  
Targeting 20+ year mine life



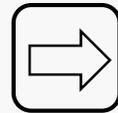
# Blue sky potential

The Browns Range 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



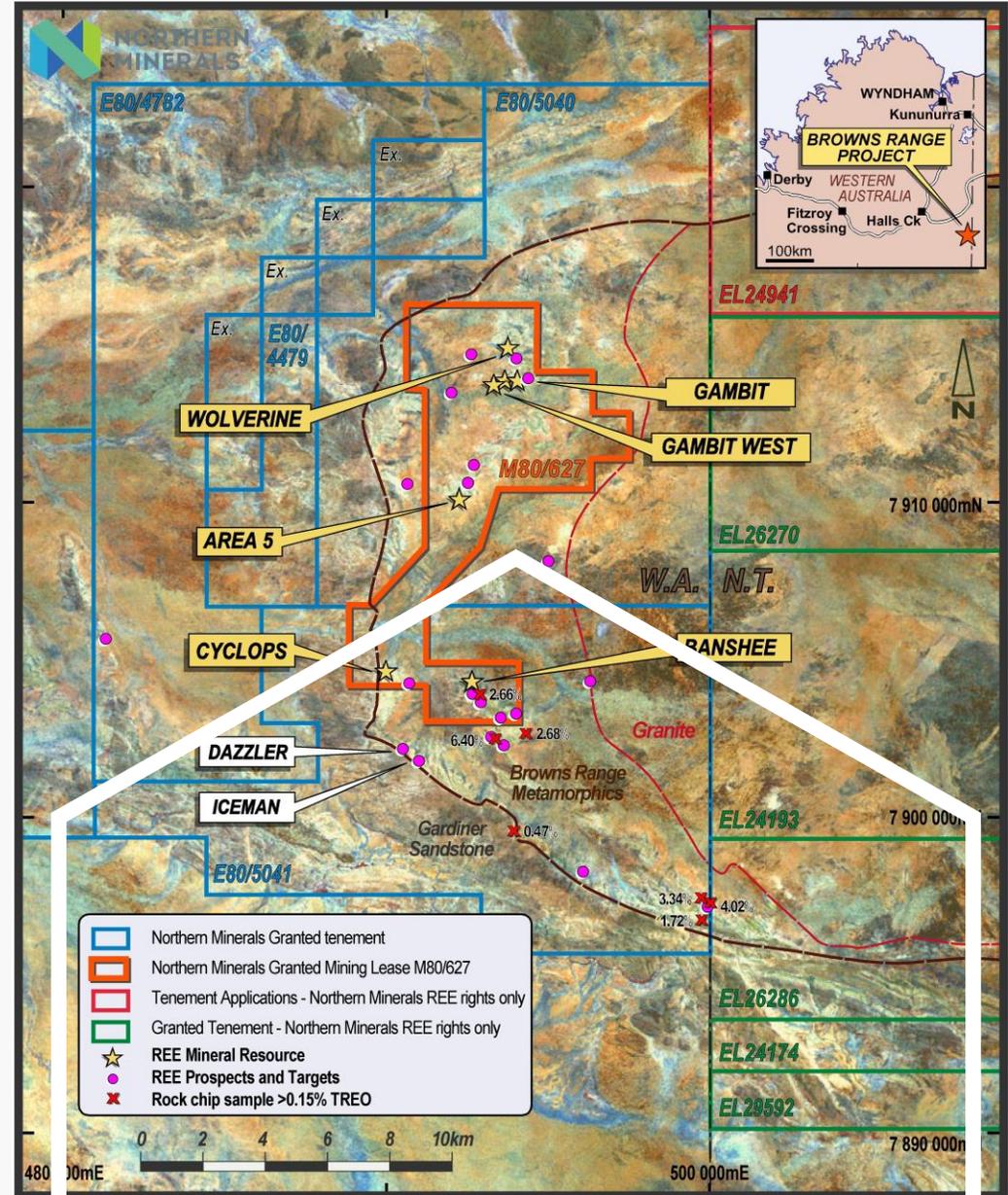
## New discoveries

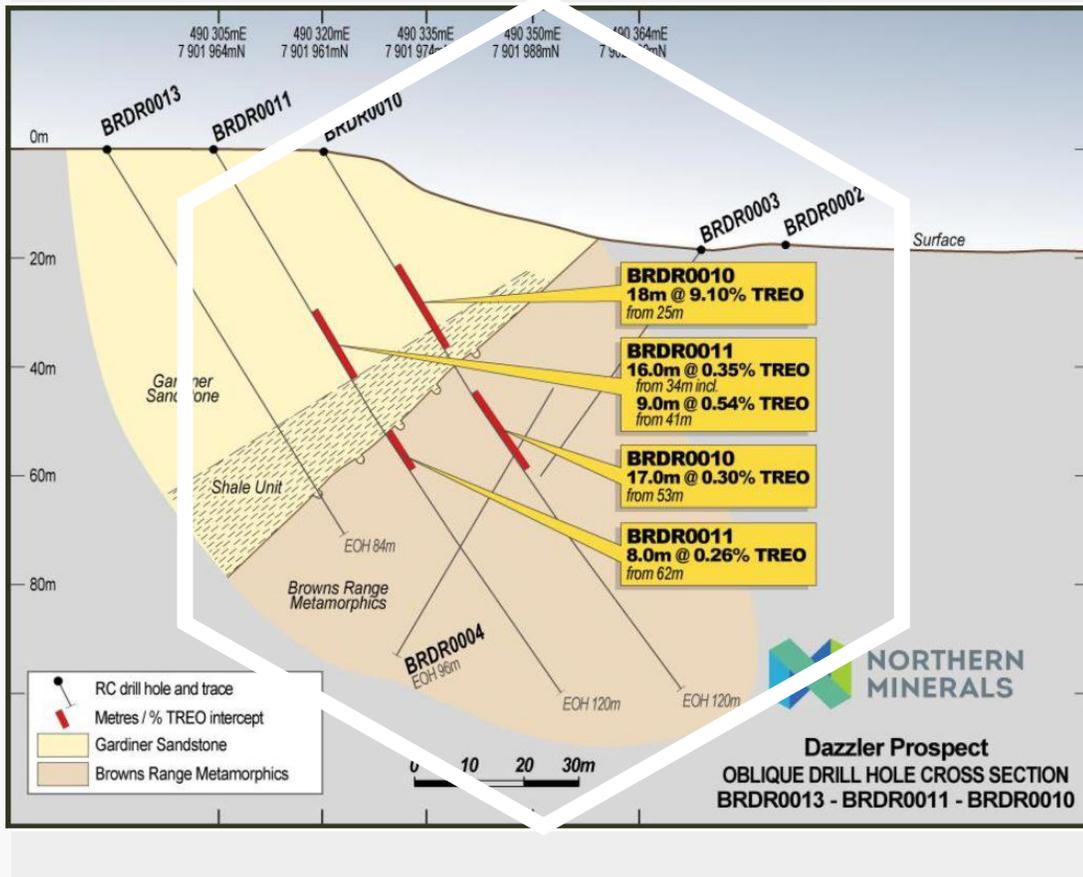
High-grade discoveries made in 2018 at Dazzler and Iceman show excellent potential



## 20+ year life target

Focus on growing mine life from 11 years to +20





# Dazzler discovery

Hole ID	Width (m)*	From (m)	To (m)	TREO %	Estimated pXRF grade
BRDR0008	3	33	36	0.34	0.5%
BRDR0008	3	41	44	0.20	
BRDR0009	3	107	110	0.22	
BRDR0009	4	112	116	0.33	
BRDR0010	18	25	43	9.10	8%
BRDR0010	17	53	70	0.30	
BRDR0011	16	34	50	0.35	0.8%
Incl	9	41	50	0.54	
BRDR0011	8	62	70	0.26	
BRDR0012	2	26	28	0.29	
BRDR0012	13	33	46	0.33	0.4%
BRDR0012	2	64	66	0.27	
BRDR0013				No significant results	
BRDR0014	21	24	45	2.15	2%
BRDR0014	7	48	55	0.29	
BRDR0014	7	59	66	0.42	0.6%
BRDR0015	2	35	37	0.20	
BRDR0015	13	42	55	0.38	0.6%
BRDR0016	4	26	30	0.14	
BRDR0016	32	33	65	0.48	

# Corporate overview



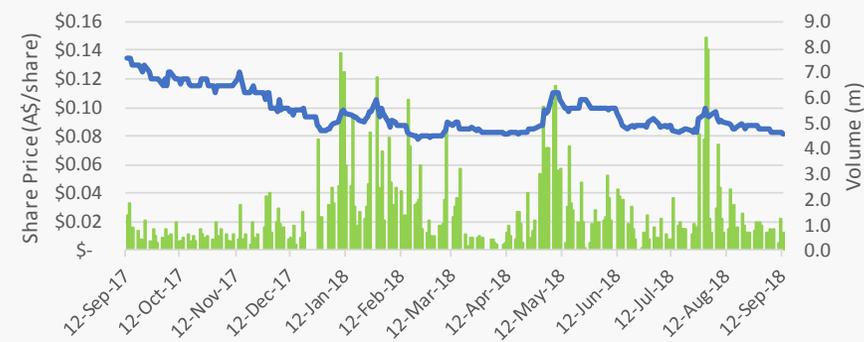
## Major shareholders

31 August 2018

ACIG	17.1%
Huatai Mining	14.8%
Citicorp Nominees	3.9%
Board & Management	2.3%
Remaining Top 20	19.4%
Other	42.5%

Ordinary Shares	1,161M
Options and Performance Rights	96.2M
Market Capitalisation	\$94M
Cash (30 June 2018)	\$10.4M
Debt (as at 12 September 2018):	
Brevet 2017/18	\$19.5M
Brevet 2018/19	\$3.0M
Lind	\$6.9M
Sinosteel	\$5.8M
R&D tax receivable 2017/18	\$19.5M
Plant book value	\$55M
12 month low - high	\$0.078 - \$0.14
Average daily volume (12 month avg)	1,412,000

## Northern Minerals (NTU) Share Price



## In conclusion

R&D testing/commissioning commenced in June 2018

Three year project to demonstrate and assess economic and technical feasibility of full scale operation

Process commenced on ore sorting and separation

Potential for additional production and new offtake agreements

Browns Range on track to be a globally significant supplier of dysprosium

Quality management and operations team focussed on delivery

An essential part of the EV evolution

# Thank you

ASX  
NTU



## Contact

**George Bauk, Managing Director & CEO**  
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**Mark Tory, Chief Financial Officer & Company Secretary**  
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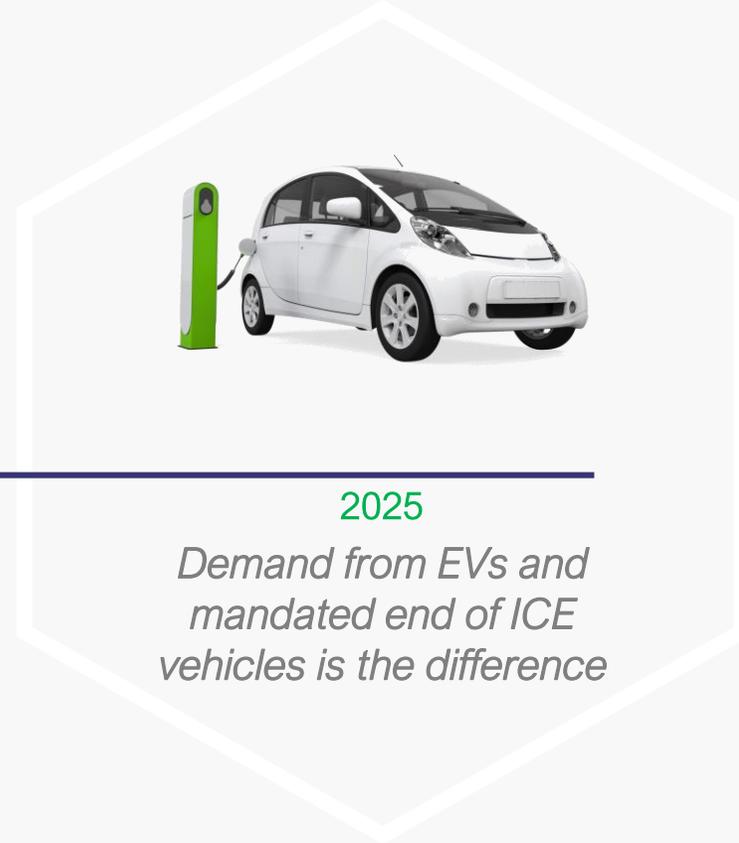
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# APPENDICES

# Strategically and politically critical

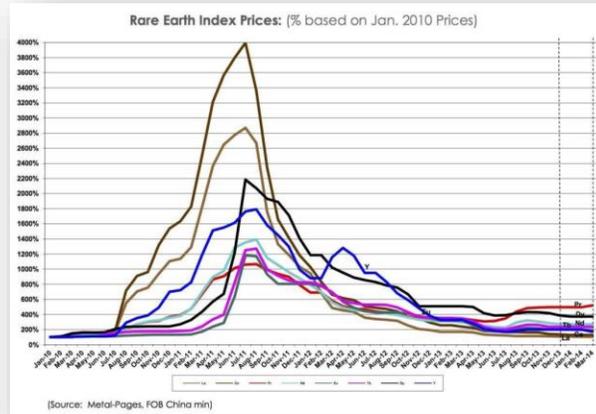
*“This executive order will prioritize reducing the nation’s vulnerability to disruptions in our supply of critical minerals safely and responsibly for the benefit of the American people,”*

US President Donald Trump



2025

*Demand from EVs and mandated end of ICE vehicles is the difference*



2011

*China cuts rare earths exports on South China Sea issues, prices skyrocket*



2018

*China dominates global supply including unsustainable supply, not green not clean.*

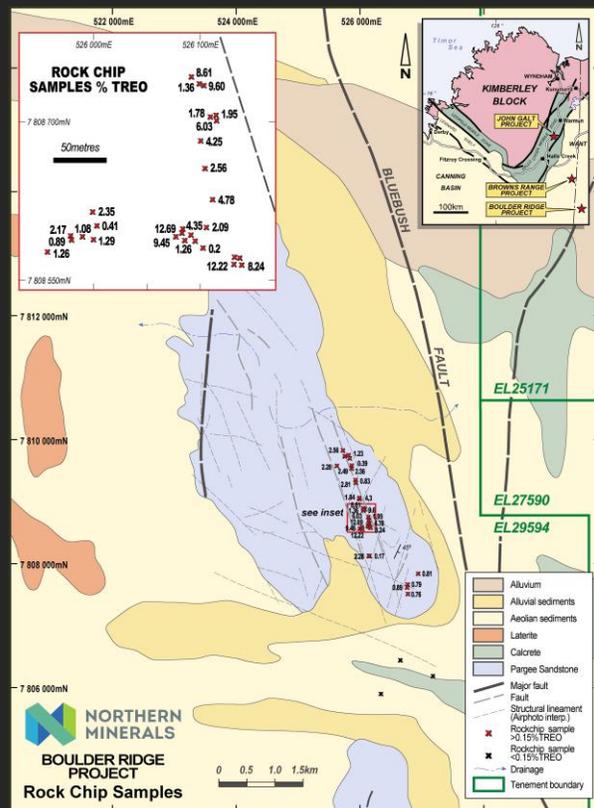
1992

*“Saudi Arabia has oil, but China has rare earths”*

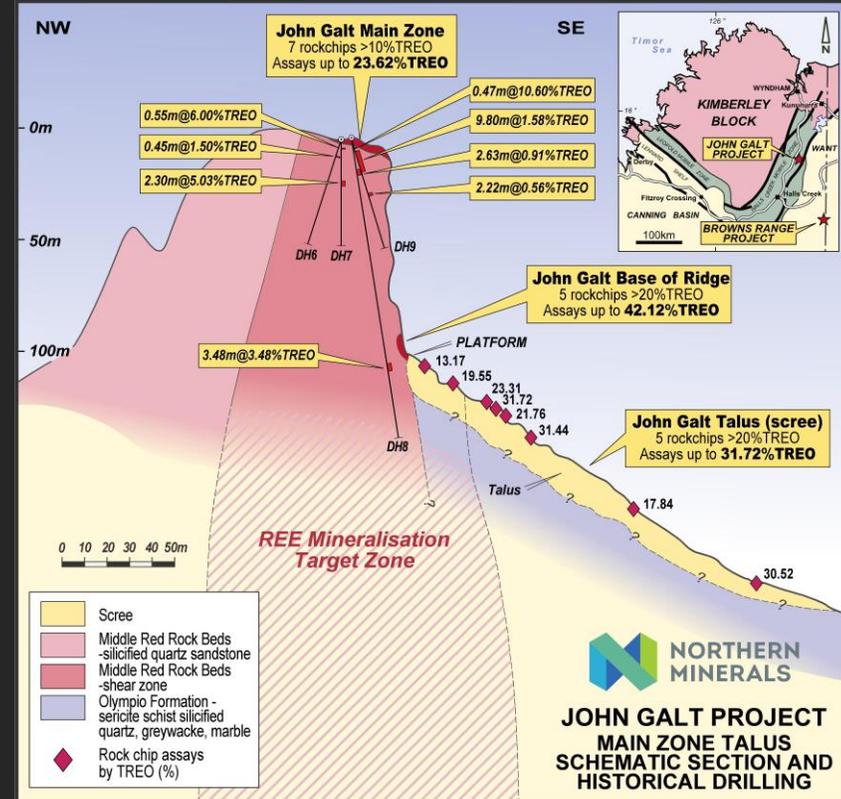
Chinese Premier, Deng Xiaoping

# Beyond Browns Range

- 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.

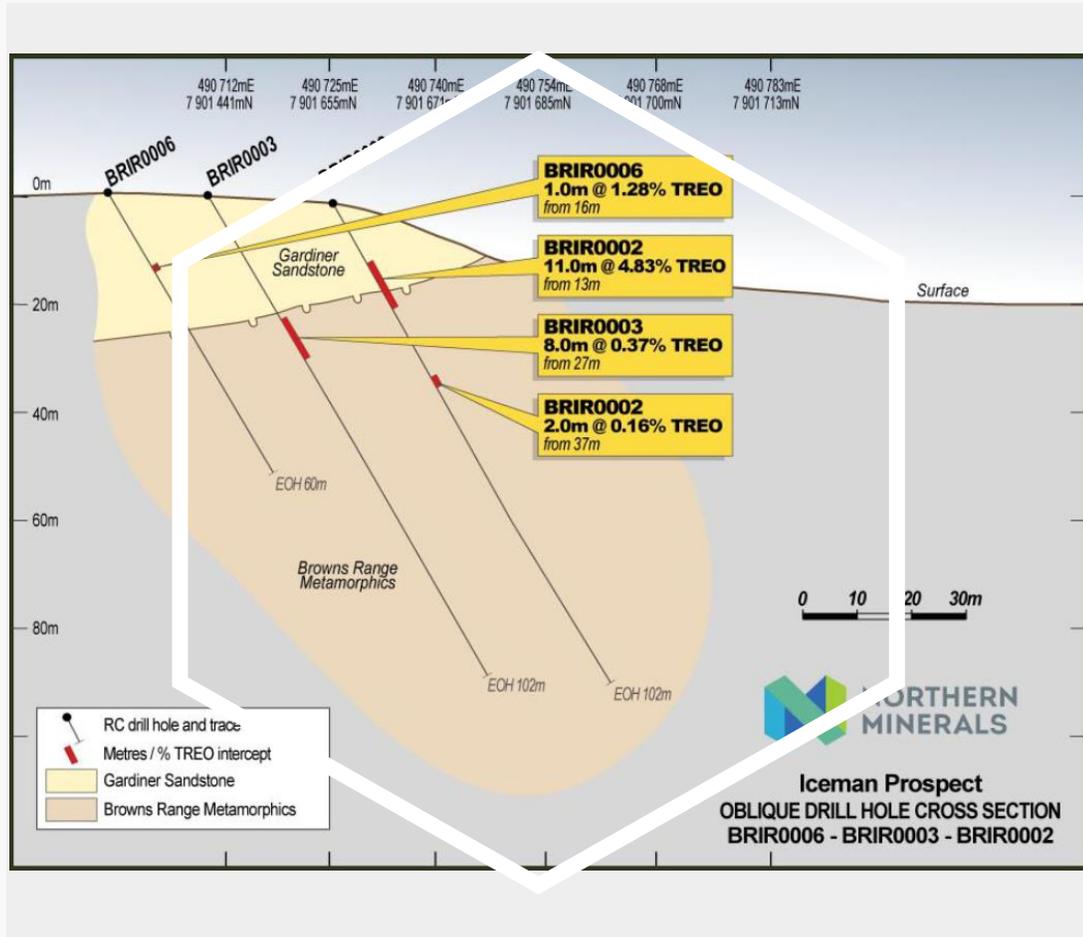


# BOULDER RIDGE



# JOHN GALT

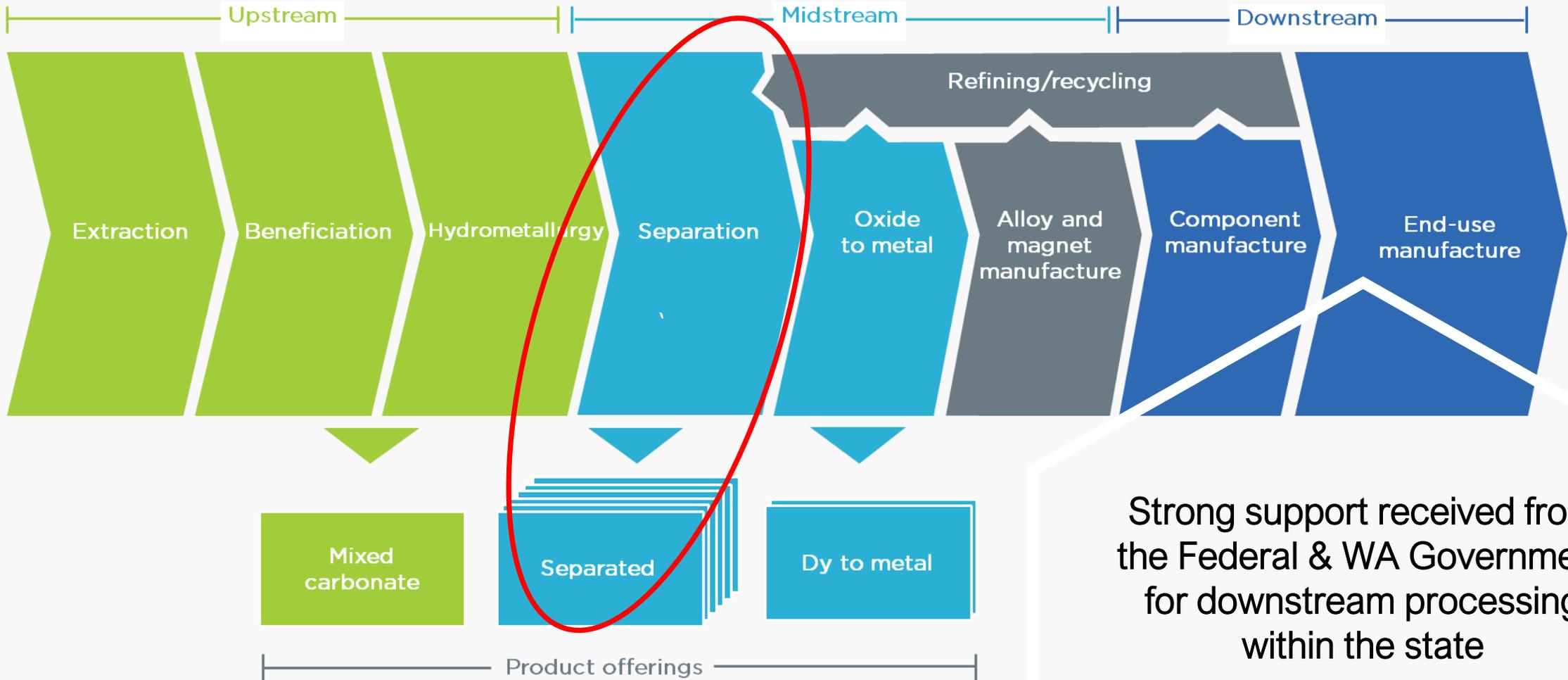
- Rock chip samples up to 42% TREO with approximately 95% Heavy REO
- Preliminary metallurgical tests indicate excellent recovery rates (>90%)
- Potential for concentrate grades >40%
- High grade mineralisation in talus (scree) material
- Hard-rock source of scree is the primary target



## Iceman discovery

Hole ID	Width (m)*	From (m)	To (m)	% TREO	Estimated pXRF grade
BRIR0001				No significant results	
BRIR0002	11	13	24	4.83	4%
BRIR0002	2	37	39	0.16	
BRIR0003	8	27	35	0.37	0.6%
BRIR0004	7	26	33	1.20	3%
BRIR0005				No significant results	
BRIR0006	1	16	17	1.28	
BRIR0007	7	42	49	1.73	1%
BRIR0008				No significant results	
BRIR0009				No significant results	

# Product separation

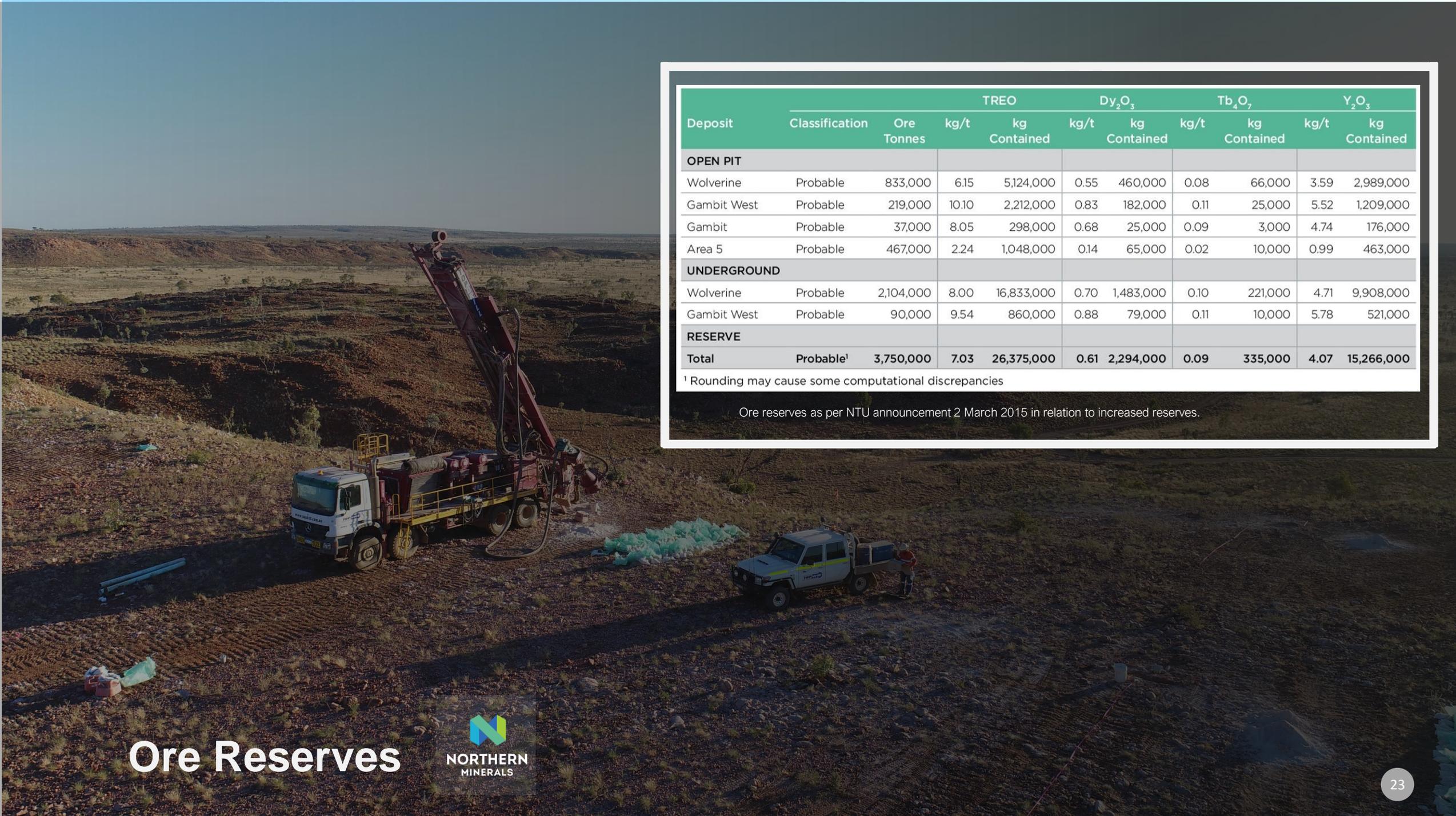


Strong support received from the Federal & WA Government for downstream processing within the state



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>

<sup>1</sup> – Rounding may cause some computational discrepancies (TREO (metal) tonnes estimated from Mt x TREO%)  
 Mineral resources as per NTU announcement 2 March 2015 in relation to increased 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
<b>OPEN PIT</b>										
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
<b>UNDERGROUND</b>										
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
<b>RESERVE</b>										
<b>Total</b>	<b>Probable<sup>1</sup></b>	<b>3,750,000</b>	<b>7.03</b>	<b>26,375,000</b>	<b>0.61</b>	<b>2,294,000</b>	<b>0.09</b>	<b>335,000</b>	<b>4.07</b>	<b>15,266,000</b>

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

Ore reserves as per NTU announcement 2 March 2015 in relation to increased reserves.

# Ore Reserves



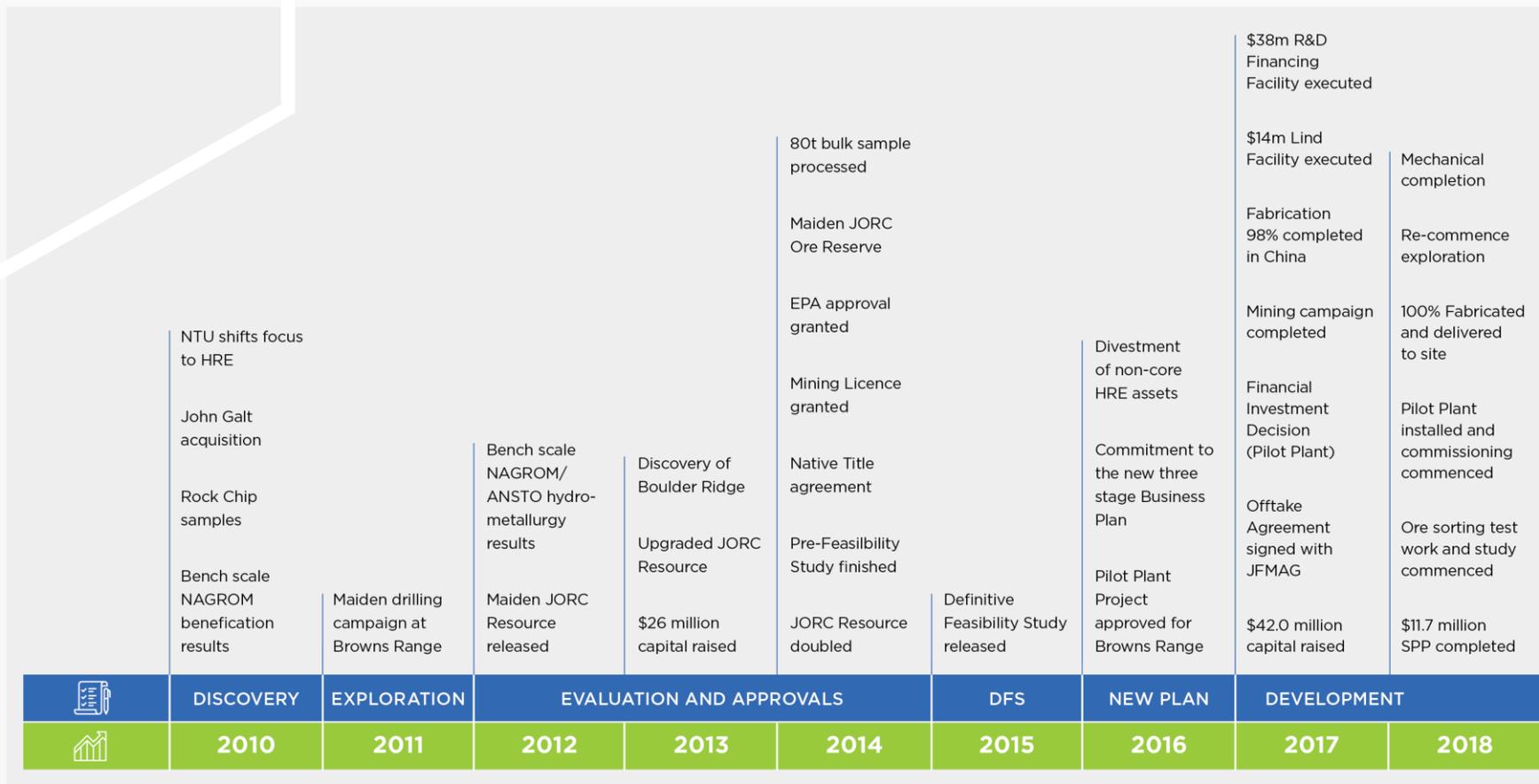
- Product specification available for REC
- REC samples validated by several downstream separators
- REC suitable for solvent extraction separation
- Low thorium and uranium levels
- First shipment planned for September quarter

REO contained in mixed RE carbonate	Annual production (000s kg)
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>
<b>Total carbonate produced</b>	<b>1,100</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>

Production table from NTU announcements dated 4 February 2016 in relation to new business plan for Browns Range and presentation of the business plan

# An eight year \$190m journey





Nan  
Yang

Colin  
McCavana

Adrian  
Griffin

George  
Bauk

Bin  
Cai

## NTU Board

01

### **Colin McCavana - Non-executive Chairman (appointed 2006)**

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

02

### **George Bauk - Managing Director / CEO (appointed 2010)**

George is an experienced executive, with over 25 years' experience in the resources industry. Prior to Northern Minerals, Mr Bauk is Vice President of the Chamber of Minerals and Energy, WA and Chairman of Lithium Australia.

03

### **Adrian Griffin - Non-executive Director (appointed 2006)**

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.

04

### **Nan Yang - Non-executive Director (appointed 2017)**

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

05

### **Yanchung Wang - Non-executive Dir (not in photo) (appointed 2013)**

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.

06

### **Bin Cai - Non-executive Director (alternate) (appointed 2013)**

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.



**NORTHERN  
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