

# REE

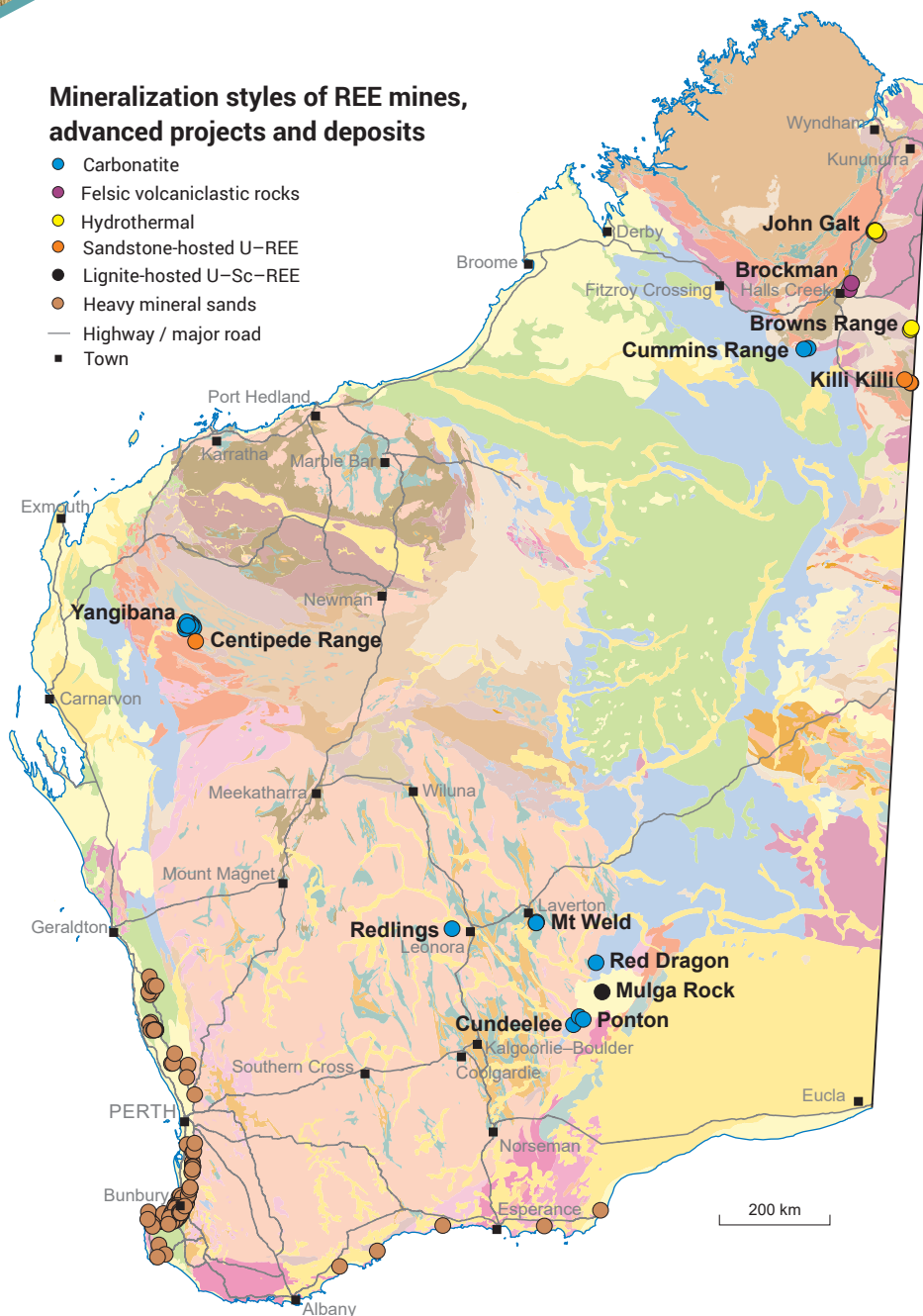
# RARE EARTH ELEMENTS

INVESTMENT OPPORTUNITIES

WORLD-CLASS RESOURCE PROVINCE | SECURE INVESTMENT LOCATION  
WORLD-LEADING GEOSCIENTIFIC DATA | GLOBAL MINING SERVICES INDUSTRY

## Mineralization styles of REE mines, advanced projects and deposits

- Carbonatite
- Felsic volcanoclastic rocks
- Hydrothermal
- Sandstone-hosted U-REE
- Lignite-hosted U-Sc-REE
- Heavy mineral sands
- Highway / major road
- Town



## Western Australia's Mt Weld mine continues to produce the majority of Australia's rare earth elements

### Mt Weld

- Record annual production for 2018–19 was 5898 t of neodymium praseodymium (NdPr) from 19 737 t of total rare earth oxide, processed in Malaysia
- Lynas Corporation has announced plans to relocate its cracking and leaching plant from Malaysia to Kalgoorlie. The \$500 million plant is expected to be operational in 2023

### Browns Range

- First production from pilot plant began in December 2018 with 89.9 kt of rare earth carbonate produced at the end of September 2019
- Full-scale production is targeted for 2020
- Recent drilling at Dazzler deposit has identified potential as a source of high-grade ore for mining

### Yangibana

- Mine construction is planned for 2020 following a second pilot plant study in 2019 which achieved a recovery rate of 80% total rare earth oxide. An on-site processing plant will produce a mixed rare earth elements carbonate product
- Approvals have been received for mining and processing operations

**\$362 m\***  
Sales value



(2018 calendar year)

**317**  
Full-time employees



**\$756 m†**  
Investment projects



**2nd**  
Production world ranking



\* Annual sales and amount of contained REE oxides after ore processing; campaign mining precludes a quote of annual ore production

† Includes projects planned, possible, committed or under construction as of September 2019



Government of Western Australia  
Department of Mines, Industry Regulation and Safety

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Geological Survey of  
Western Australia



## Top REE projects with resources

Resources estimated according to JORC

Project	Host rocks	Project owner	Status	Resources (Mt)	Av. grade* (% TREO)	Contained TREO (kt)	REE dominance
Mt Weld	regolith, carbonatite	Lynas Corp. Ltd	Operating	93.0	3.69	3428.7	LREE
Yangibana	carbonatite	Hastings Technology Metals Ltd	Under development	21.3	1.12	255.6	LREE
Cummins Range	regolith, carbonatite	RareX Ltd	Exploration	13.0	1.13	147.3	LREE
Brockman	trachytic tuff	Hastings Technology Metals Ltd	Feasibility study	41.4	0.21	87.5	LREE and HREE
Browns Range	Hydrothermal	Northern Minerals Ltd	Under development	9.2	0.66	60.5	LREE

\* Total lanthanide rare earth oxides, including yttrium

LREE: Light rare earth elements

HREE: Heavy rare earth elements

Note: Totals have been rounded

## Classification of REE

57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97	39 Y 88.906
LREE							HREE								

Note: All of promethium (Pm) isotopes are radioactive. Therefore, promethium cannot be recovered from mineralized ore

## REE prospectivity of Western Australia

Western Australia has great exploration potential for REE in:

- carbonatite and alkaline to peralkaline ring complexes
- felsic volcanoclastic rocks
- hydrothermal systems
- heavy mineral sands
- sandstone-hosted and lignite-hosted U-REE

Currently REE are used across the technology, automobile and renewable sectors in:

- batteries in electric and hybrid cars
- smart phones and computers
- magnets
- pigments and chemical catalysts

### For more information



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