

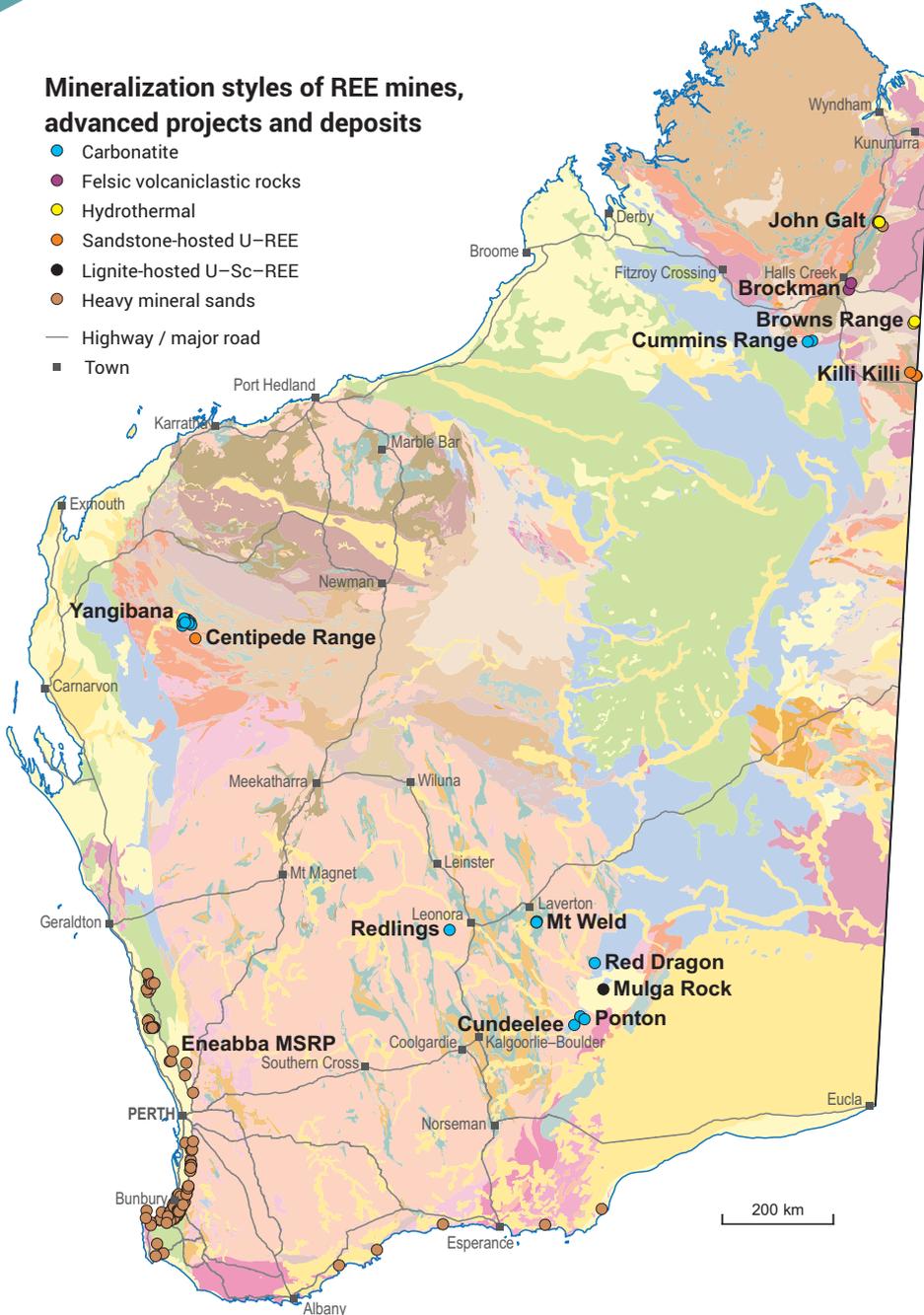
RARE EARTH ELEMENTS

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



New rare earth oxide processing facilities planned for Western Australia

Mt Weld

- Record annual production for 2018–19 was 5898 t of neodymium praseodymium (NdPr) from 19 737 t of total rare earth oxide (TREO), 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
- Lynas has entered into an agreement with the US Government to build a light rare earth element (LREE) separation facility with potential to include a heavy rare earth element separation capacity. The US-based facility will likely receive material processed at the cracking and leaching facility, under development in Kalgoorlie

Browns Range

- Production from the Browns Range Pilot Plant reached 210 000 kg of rare earth carbonate in 2021
- Exploration continues at the Dazzler, Gambit, Wolverine and Toad prospects

Yangibana

- Early works have begun following a second pilot plant study in 2019 which achieved a recovery rate of 80% TREO. An on-site processing plant will produce a mixed rare earth elements carbonate product
- Approvals have been received for mining and processing operations

Eneabba Mineral Sand Recovery Plant (MSRP)

- A pre-feasibility study is underway to build an REE processing plant at Iluka's Eneabba mine site. The feed stock will be sourced from monazite-rich mineral sands recovered from stockpiles at Eneabba and other Iluka mine sites
- Monazite is a heavy mineral which contains neodymium, praseodymium, cerium and lanthanum

27 104 t
Tonnes sold



170
Full-time employees



\$1313 m[†]
Investment projects



4th
Production world ranking



(2020–21 financial year)

* 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 October 2021



REE ranked by contained TREO >60 kt

Resources estimated according to JORC 2012

Project	Status	Owner	Host rocks	Resources (Mt)	Av. grade* (% TREO)	Contained TREO (kt)	Rare Earth Elements
Mt Weld	Operating	Lynas	regolith, carbonatite	54.50	5.20	2833	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y
Cummins Range	Exploration	Rarex	regolith, carbonatite	18.80	1.98	372	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y
Yangibana	Feasibility	Hastings Technology Metals / Mojito Resources	carbonatite	27.42	0.97	266	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y
Brockman	Pre-feasibility	Hastings Technology Metals	trachytic tuff	41.40	0.21	87	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y
Browns Range	Operating	Northern Minerals	hydrothermal	9.20	0.67	62	La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y

Resource estimates have been rounded

Abbreviations: LREE, light rare earth elements; HREE, heavy rare earth elements; TREO, total rare earth oxide

* Total lanthanide rare earth oxides, including yttrium

Classification of REE

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

LREE

HREE

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

La Lanthanum	Ce Cerium	Pr Praseodymium	Nd Neodymium
Pm Promethium	Sm Samarium	Eu Europium	Gd Gadolinium
Tb Terbium	Dy Dysprosium	Ho Holmium	Er Erbium
Tm Thulium	Yb Ytterbium	Lu Lutetium	Y Yttrium

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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Geological Survey of
Western Australia

