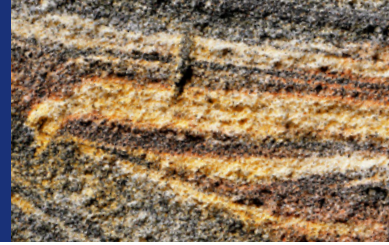
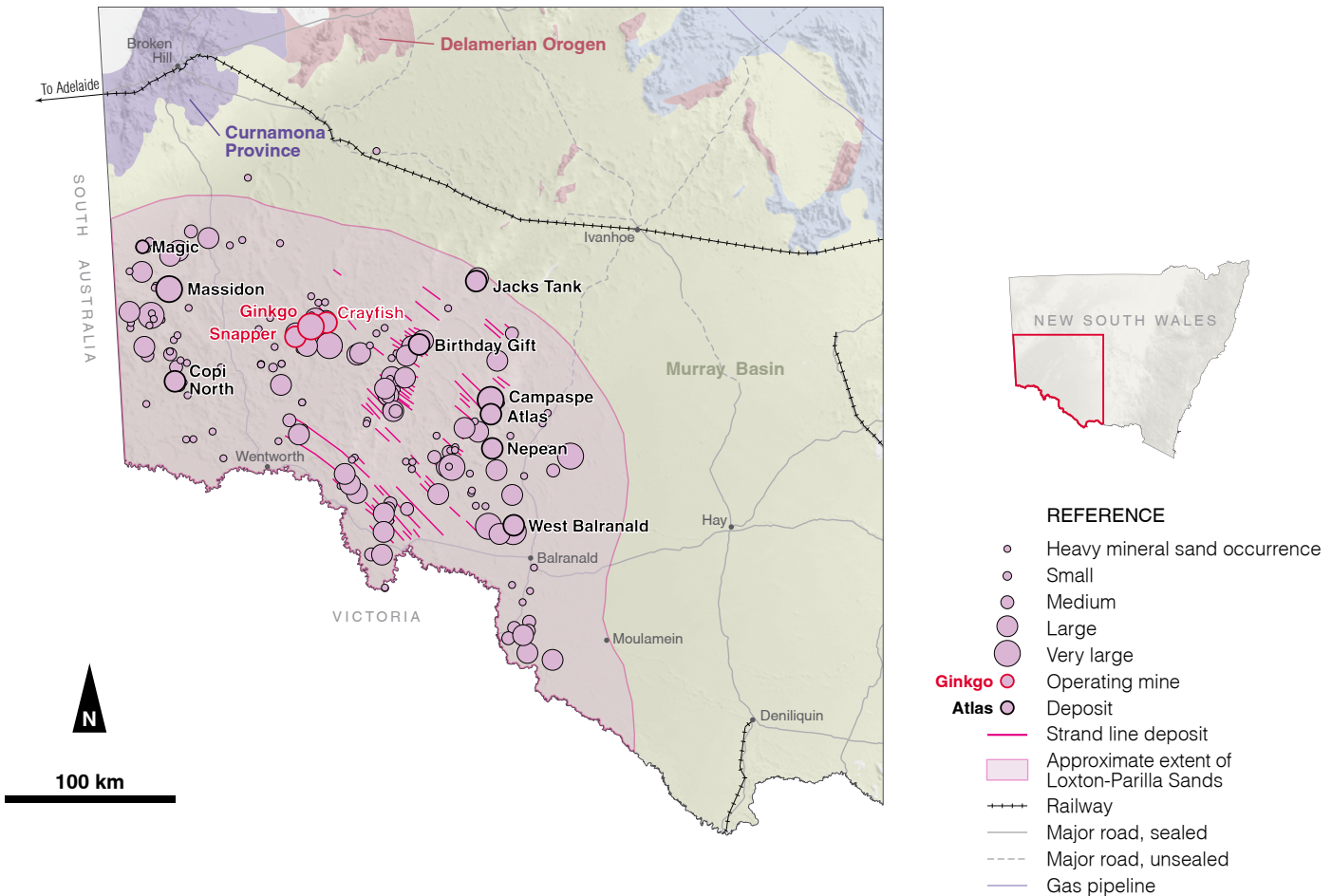


Heavy mineral sands

Opportunities in New South Wales, Australia



DECEMBER 2021



Overview

- The Murray Basin of New South Wales (NSW) is a world-class heavy mineral (HM) sand province.
- Major mines are in production, with several projects under development.
- There is outstanding potential for the development of known resources and for the discovery of large HM sand deposits.

Geological setting

The Murray Basin is an intracratonic sedimentary basin known for its high quality coarse-grained rutile, zircon and ilmenite. It covers 300,000 km² of NSW, Victoria and South Australia. The Loxton-Parilla Sands, which extends over much of this area, hosts major heavy mineral sand deposits and is highly prospective for further discovery.

The Murray Basin of NSW is a globally significant mineral sands province. The basin currently hosts over 145 Mt of heavy mineral sands. This inventory totals an estimated:

- 89.7 Mt ilmenite (FeO.TiO₂)
- 27.1 Mt rutile (TiO₂)
- 21.6 Mt zircon (ZrO₂.SiO₂)
- 8.3 Mt leucoxene (FeO.TiO₂)

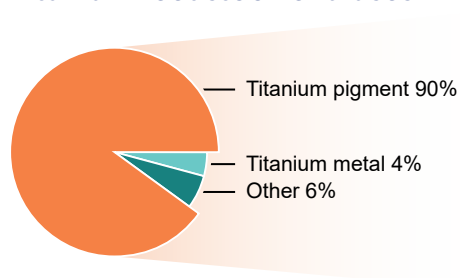
It also has potential for monazite (Ce,La,Nd,Th)PO₄ — prospective for heavy rare earths — and xenotime (YPO₄).

Highlights

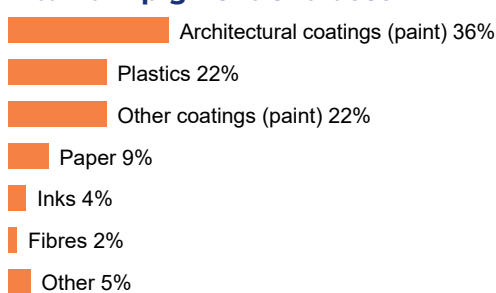
- Coarse-grained, linear strand-line deposits (e.g. Birthday Gift)
- High-grade deposits (e.g. West Balranald and Nepean) that are being trial-mined using revolutionary *in situ* borehole mining techniques
- Finer-grained, dune deposits with high rutile content (e.g. Crayfish)
- Deposits that are partly or entirely amenable to dry mining



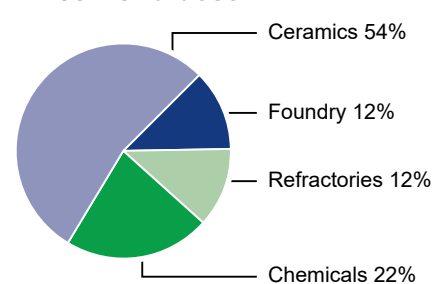
Titanium feedstock end uses



Titanium pigment end uses



Zircon end uses



Source: [http://argex.ca/documents/Cormark%20Argex%20Report%20\(9-Jan-13\)%20.pdf](http://argex.ca/documents/Cormark%20Argex%20Report%20(9-Jan-13)%20.pdf)

Source: <http://www.indmin.com/TiO2Zircon.html>

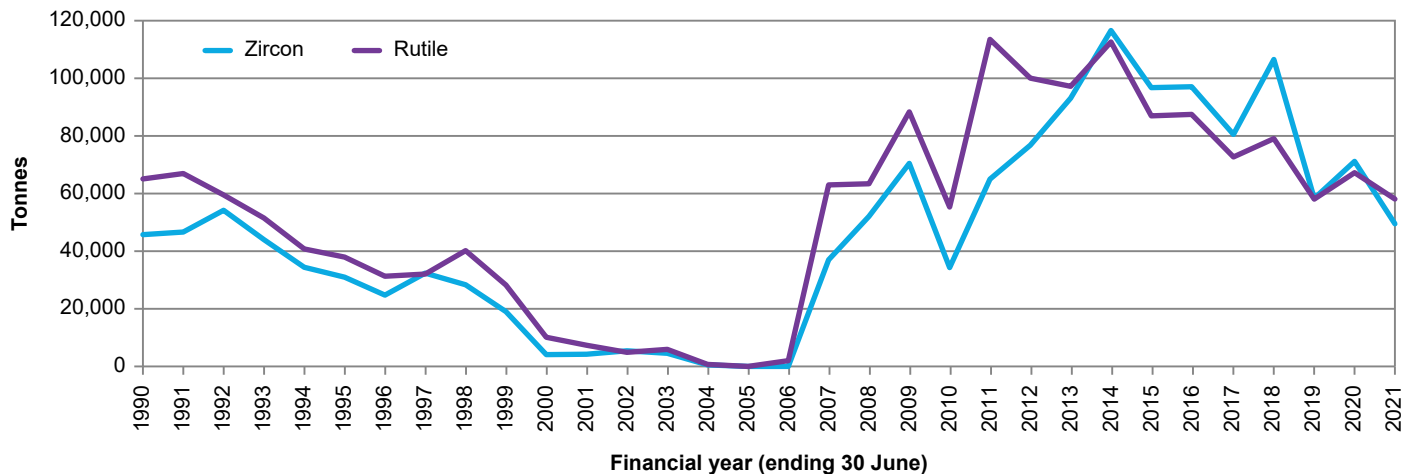
Project highlights

Mine name	Current resources and reserves (JORC or equivalent)	Total contained HM (t)*
Ginkgo	(proved & probable) 205 Mt @ 3.3% HM (pre-mining reserve)	-
Ginkgo-Snapper-Crayfish	(total reserves) 57 Mt @ 2.1 % HM	1,197,000
Snapper	(measured) 117 Mt @ 5.4% HM (pre-mining)	-

Project name	Current resources and reserves (JORC or equivalent)	Total contained HM (t)*
Atlas & Campaspe	(probable) 88 Mt @ 6.5% HM	5,720,000
Copi North	(indicated & inferred) 14.2 Mt @ 6.6% HM	937,200
Jacks Tank North	(inferred) 13 Mt @ 1.9% HM (coarse-grained HM)	247,000
Jacks Tank South	(inferred) 41 Mt @ 2.6% HM (fine-grained HM)	1,066,000
Magic	(inferred) 15 Mt @ 3.7% HM	555,000
Massidon	(indicated & inferred) 429.9 Mt @ 2.49% HM	10,704,510
West Balranald	(measured, indicated & inferred) 35.8 Mt @ 33.8% HM	12,100,000
West Balranald & Nepean	(combined inferred resource) 50.1 Mt @ 32.2% HM	16,300,000

* Total heavy minerals calculated only from resource quoted above (not necessarily total valuable heavy minerals).

Heavy mineral sands production in New South Wales (1990–2021)



Ilmenite and leucoxene statistics not shown.

Source: NSW royalty statistics



Dredges at work at Snapper mine.

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