

Critical Minerals & Strategic Materials for the Energy Transition

Dr Bronwyn Camac | 22 October 2024

energymining.sa.gov.au



Critical Minerals | what are they and why are they critical?

Early in 2024, the Australian Government updated the listing and now considers 31 elements on the Critical Minerals list; and 5 Strategic Materials

A Critical Mineral is described as a metallic or non-metallic element that has two characteristics:

1. it is essential for the functioning of our modern technologies, economies or national security;
2. for which Australia has geological potential for resources; **and**
3. there is a risk that its supply chains could be disrupted.

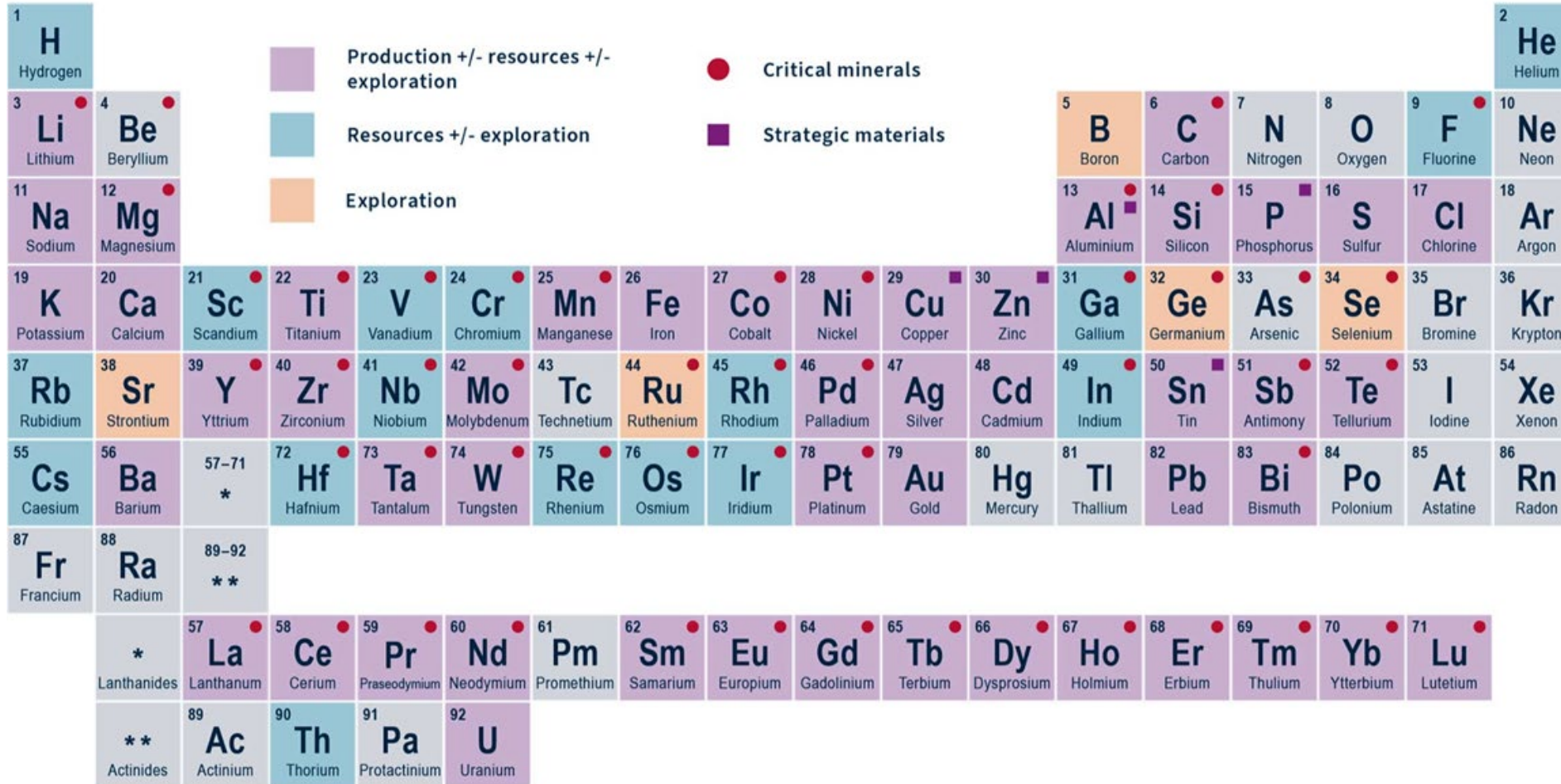
A Strategic Material is:

1. important for the global transition to net zero and broader strategic applications, specifically the priority technologies set out in the Critical Minerals Strategy
2. for which Australia has geological potential for resources
3. in demand from our strategic international partners.

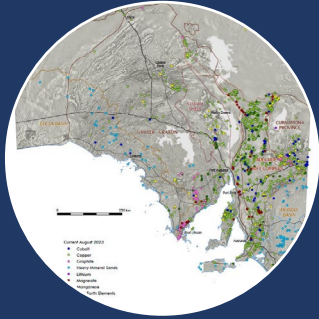




Australia: a wealth of resources



Critical Minerals South Australia Project



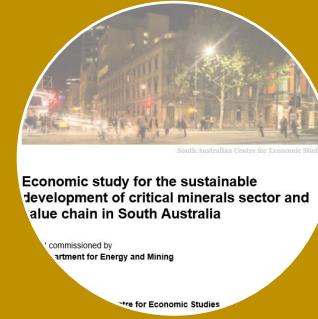
**Stocktake
of SA's CM
prospectivity**



**Reassessing
SA's deposits
for untapped
CM potential**



**Secondary
potential of
mine waste**



**Economic
study
SA's CM
value chain**



**SA's CM
dashboard &
SARIG
delivery**

Critical Minerals South Australia Project



What do we already know – and maybe forgotten?




**Stocktake
of SA's CM
prospectivity**

- reviewing and identifying key mineralisation styles for defined critical minerals, mapping existing critical mineral occurrences across the State and identifying regions with significant geological potential

→ increase industry and investor understanding of South Australia's critical mineral potential



Element	Where in SA
Graphite; Kaolinite	Eyre Peninsula
Magnesium	Leigh Creek
Manganese; Cobalt; Bismuth; Magnesium	Middleback Ranges, Curnamona
High Purity Alumina	Gawler Craton
Lithium	Curnamona, KI, Delamerian granites, Flinders
Tin	Northern Flinders, Gawler Craton
Nickel / Platinum Group Elements	Musgraves
Molybdenum	Curnamona

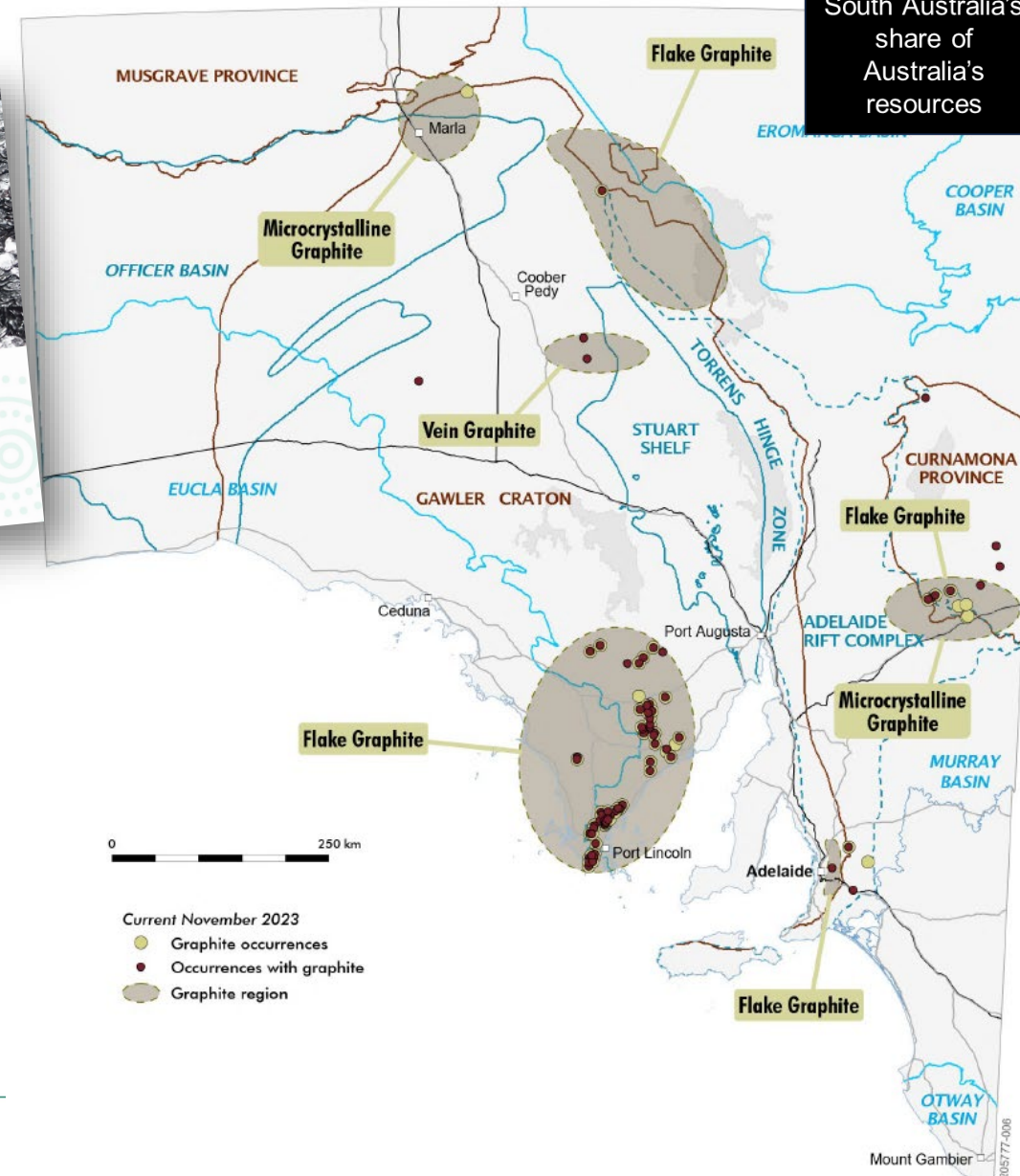
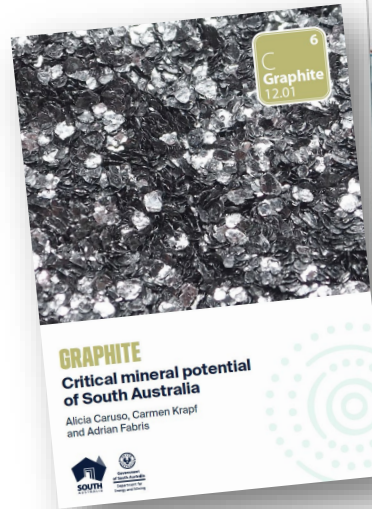
GRAPHITE

essential for BAM production

66%

South Australia's share of Australia's resources

- 75 graphite occurrences, with 8 of these listed as deposits.
- SA contains **66%** of Australia's confirmed graphite resources.
- Most on Eyre Peninsula and hosted in highly metamorphosed Neoproterozoic to Paleoproterozoic rocks.
- Siviour deposit is world's second largest proven graphite reserve** with a resource of **123.6Mt @ 6.9% TGC** (Renascor Resources 2023)
- 4Mt (reserves) | 9 Mt (resource)

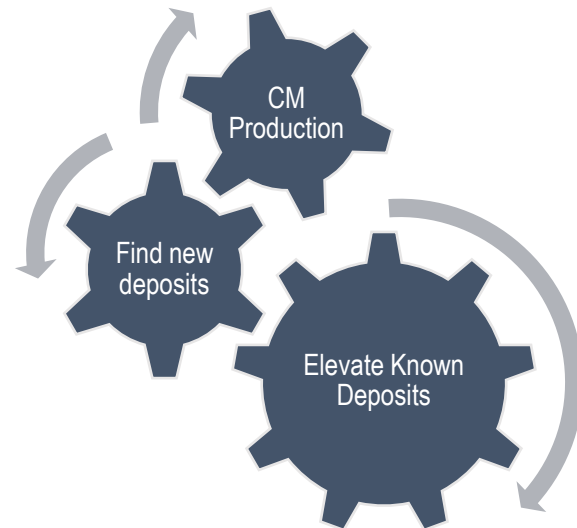


Legacy core is a gold mine of untapped information



Reassessing SA's deposits for untapped CM potential

- new precompetitive geoscience data and information by resampling and reanalysis of existing drill core from SA's Drill Core Reference Library
- resampling focuses on all major projects in the State's project pipeline and investigate existing occurrences and regions of the State identified as having high potential to host critical minerals



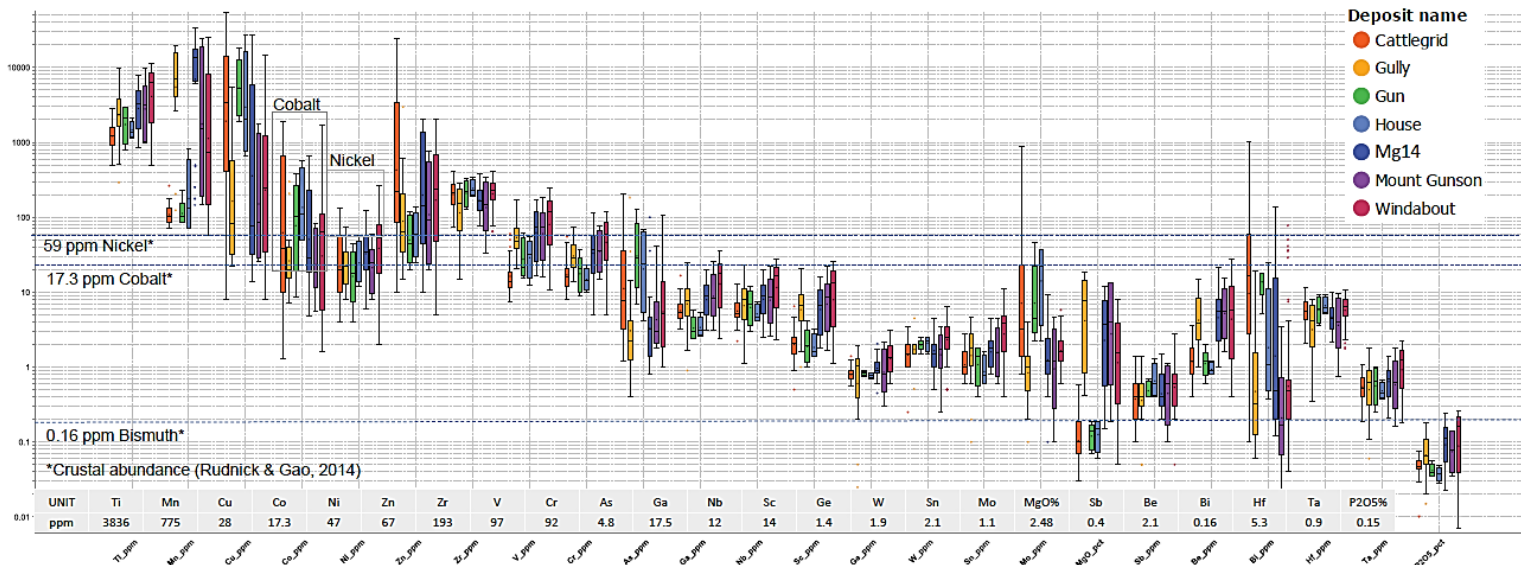
- Using geochemistry to assess untapped critical minerals potential of SA's deposits
- Evaluate SA's REE and Lithium mineral potential
- Where are SA's carbonatites?
- Review CM prospectivity of the eastern Musgraves

Using geochemistry to assess untapped critical minerals potential of SA's deposits

Mount Gunson mineral district

- hosts several sediment-hosted copper deposits
- following an extensive geochemical review, 167 samples were collected from 21 historic drillholes focusing on the mineralised zone and analysed for a full range of geochemical elements

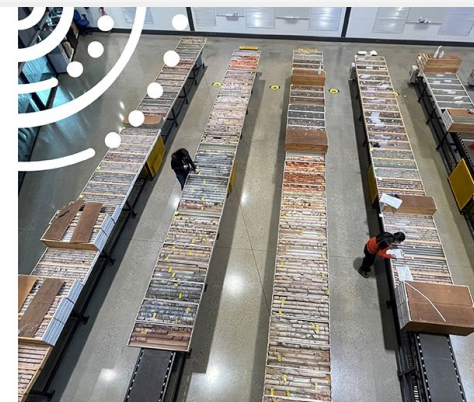
Findings: high values of cobalt, bismuth, molybdenum, silver, zinc, lead, manganese and arsenic



Using geochemistry to assess the untapped critical minerals potential of South Australia's deposits

Sediment-hosted copper deposits of the Mount Gunson district

Mirella Terrones, Adrian Fabris and Carmen Krapf



NEW REPORT BOOK AND DATA PACKAGE OUT NOW!

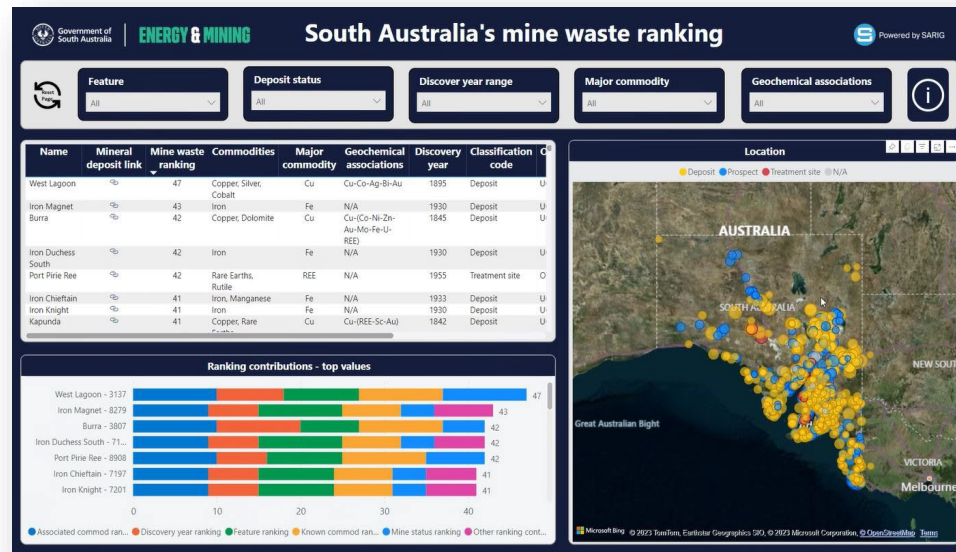
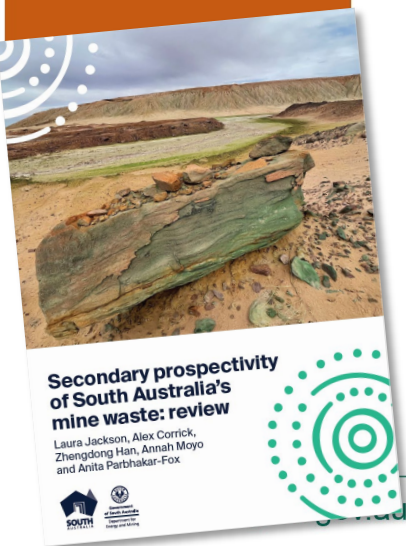


Looking for Critical Minerals in Mine-waste

- Examining potential of tailings, stockpiles and waste dumps from historic mining operations to host critical minerals content in partnership with MIWATCH (*Sustainable Minerals Institute, Univ. Queensland*) and Geoscience Australia (GA)
- Identifying and ranking potential of SA's historical mine waste based on publicly accessible data
- Active sampling of selected mine waste sites to provide assessment of their critical metal endowment and mineralogy



Secondary potential of mine waste



Mine waste sites sampled
 Brukunga, Port Pirie, Mount Gunson, Kanmantoo
 Alma & Victoria, Paratoo



Secondary prospectivity of South Australia's mine waste: Brukunga

Laura Jackson, Le Xi King and Anita Parbhakar-Fox

Economic Potential of Critical Minerals in SA



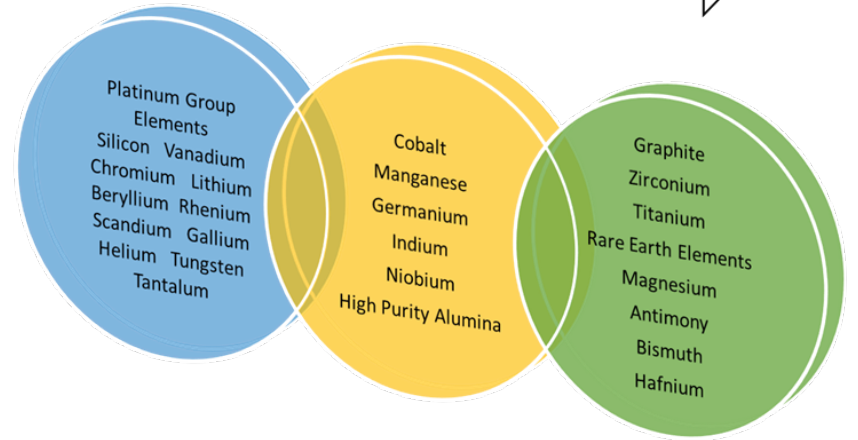
- Detailed economic study to qualify state, national and international drivers, which will influence a material shift to establishing a critical minerals sector and value chain in South Australia, from mining to processing and manufacture
- including focused analysis on cobalt, magnesium, graphite, manganese, REE and high purity alumina (HPA)



World economic demonstrated resources	World Mine production	Aust. share of world resources ⁽¹⁾	Aust. world ranking for resources ⁽²⁾	Aust. share of world production ⁽³⁾	Aust. world ranking for production ⁽⁴⁾	SA share of Australia's Economic Demonstrated Resources ⁽⁵⁾
kt	t / kt	per cent	rank	per cent	rank	per cent
no data	no data					np
2,000	109 kt	6.8	6	3.1	4	np
	260 t	unknown	unknown	unknown	unknown	np
	19 kt	unknown	unknown	unknown	unknown	np
569,620	41,400 kt	0.0	0	0.0	0	np
7,800	165 kt	20.3	2	3.2	3	2.0
	430 t	unknown	unknown	unknown	unknown	np
	140 t	unknown	unknown	unknown	unknown	np
333,000	1,000 kt	2.4	8	0.0	0	np
	no data	unknown	unknown	unknown	unknown	np
	160 hm ²	2.5				np
no data	920 t	unknown	unknown	unknown	unknown	np
23,400	105 kt	28.6	2	53.0	1	np
265,000	30,000 kt	3.9	4	3.0	5	np
338,000	19,500 kt	9.0	4	11.0	3	0
17,000	75 kt	unknown	unknown	unknown	unknown	np
0158 t	380 t	0.4	minor	0.1	minor	np
25,000	240 kt	3.4	6	8.0	4	np
	59 t	unknown	unknown	unknown	unknown	np
data	no data	unknown	unknown	0.0	0	np
	8 kt	unknown	unknown	unknown	unknown	np
140	2.1 kt	unknown	unknown	4.8	5	np
1,700	14,400 kt	23.0	2	4.2	8	4
100	600 kt	63.0	1	26.0	1	2
10	79 kt	15.4	2	minor	minor	np
10	110 kt	30.8	2	0.0	0	0
10	1,600 kt	72.0	1	30.0	1	6
10	20,900 kt	11.3	2.0	3.9	8	69
10	2,700 kt	22.6	1.0	5.6	5	0
10	47.3 kt	32.2	1.0	8.0	4	82



SA's potential for Critical Mineral supply: proximity to economic production



Delivering Critical Information to Industry



SA's CM dashboard & SARIG delivery

- Implementing innovative data visualisation and analytics functionality that supports new critical mineral discoveries and exploration in SA
- Enabling access to new pre-competitive critical mineral geoscience data and information via interactive, self-service data visualisations and dashboards to support industry and investor interest and understanding South Australia's critical mineral potential

Government of South Australia | ENERGY & MINING | South Australia's strategic critical minerals | Powered by SARIG

Total projects: 33 | Total major mines: 17 | Total developing projects: 16

Filters: Project name, Company, Status

Project name	Project	Commodity	Company	Company link	Status	Mineral deposit link
Alford East	Mining Projects	Copper (Cu), Gold (Au)	Thor Energy Plc		JORC Resource	
Angas	Major Mines	Zinc (Zn), Lead (Pb), Silver (Ag), Gold (Au), Copper (Cu)	Terramin Australia Limited		Care and Maintenance	
Atacama	Mining Projects	Heavy minerals (HM)	Iluka (Eucia Basin) Pty Ltd		Assessment	
Cairn Hill	Major Mines	Magnetite (Fe3O4), Copper (Cu), Gold (Au)	Cu-River Mining Australia Pty Limited		Care and Maintenance	
Campoona	Major Mines	Graphite	Archer Materials Limited		ML granted (PEFR pending)	
Carrapateena	Major Mines	Copper (Cu), Gold (Au), Silver (Ag)	BHP Group Pty Ltd		Operating	
Elizabeth Creek	Mining Projects	Copper (Cu), Cobalt (Co), Silver (Ag), Zinc (Zn)	Coda Minerals Ltd		Feasibility Studies	
Fremantle Doctor	Mining Projects	Copper (Cu), Gold (Au), Silver (Ag)	OZ Exploration Pty Ltd		JORC Resource	
Great White	Major Mines	Kaolin	Andromeda Metals Limited		Approved	
Hammerhead	Mining Projects	Kaolin halloysite	Andromeda Metals Limited		JORC Resource	
Hillside	Major Mines	Copper (Cu), Gold (Au)	Rev Minerals Ltd		Approved	
Jacinth	Major Mines	Heavy minerals (HM)	Iluka Resources		Operating	

Location: Map of South Australia showing project locations.

Status: Donut chart showing project status distribution.

- JORC Resource: 31.02%
- Care and Maintenance: 10.34%
- Operating: 27.59%
- Advanced Exploration: 3.45%
- ML Granted (PEFR pending): 6.9%
- Feasibility Studies: 17.24%

Government of South Australia | ENERGY & MINING | South Australia's strategic critical minerals | Powered by SARIG

Magnesium

Reserve and resources: Reserve contained product by tonnes: N/A; Resource contained product by tonnes: 146M; Number of mineral occurrences: 12

Mineral occurrence filters: Deposit name, Deposit type, Deposit status

Mineral occurrence deposit status: Donut chart showing deposit status distribution.

Commodity layer: Infrastructure layer

Name	Mineral deposit links	Resource type	Resource class	Ore Resource	Ore Resource Unit	Resource grade average
Babbage		Non-JORC	Estimated	250000000	Tonne	1
Davenport Creek		Non-JORC	Estimated	500000000	Tonne	1
Uniquem Creek No.1		Non-JORC	Estimated	200000000	Tonne	1
Camel Flat						

Summary: Ceased 8.33%, Not worked 91.67%

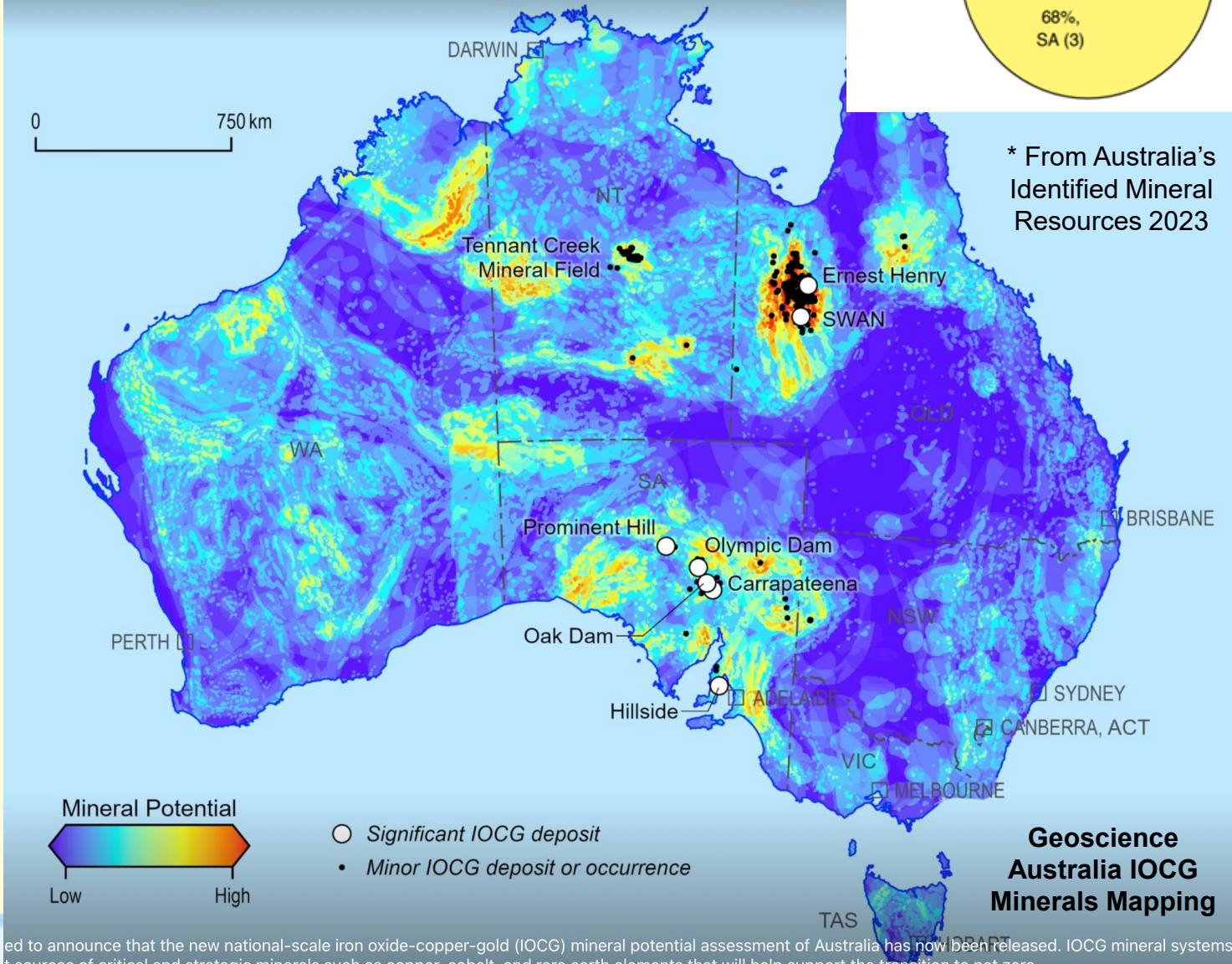
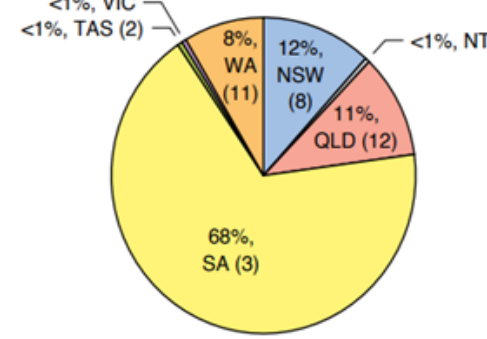


COPPER

integral to the global energy transition

OFFICIAL

Copper *



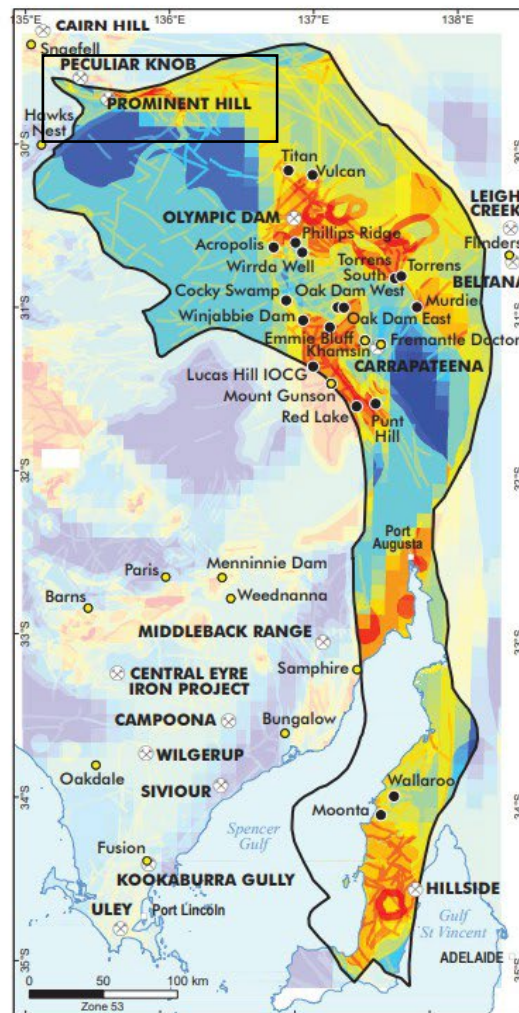
* From Australia's Identified Mineral Resources 2023

...ed to announce that the new national-scale iron oxide-copper-gold (IOCG) mineral potential assessment of Australia has now been released. IOCG mineral systems are a source of critical and strategic minerals such as copper, cobalt, and rare earth elements that will help support the transition to net zero.

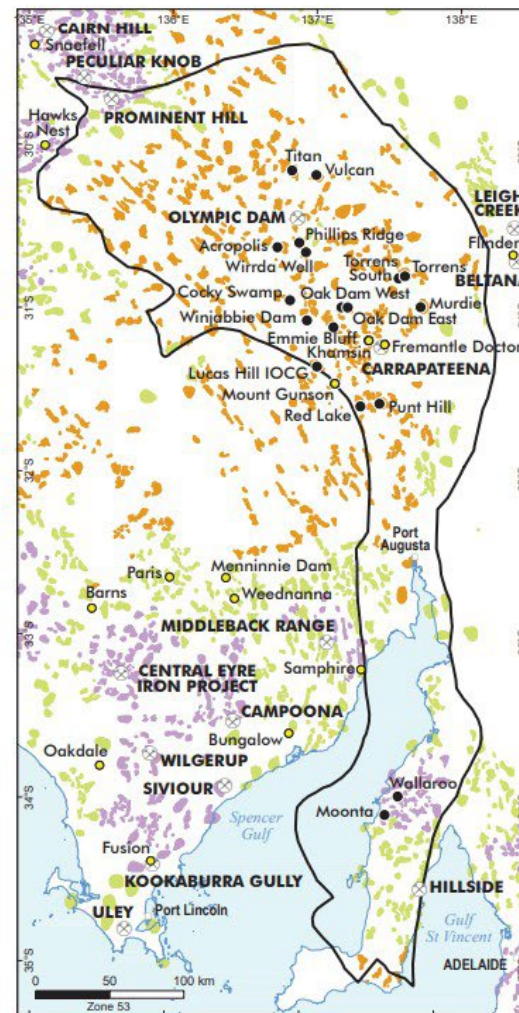
Future copper prospectivity- Olympic Cu-Au province along the Northern Water Supply



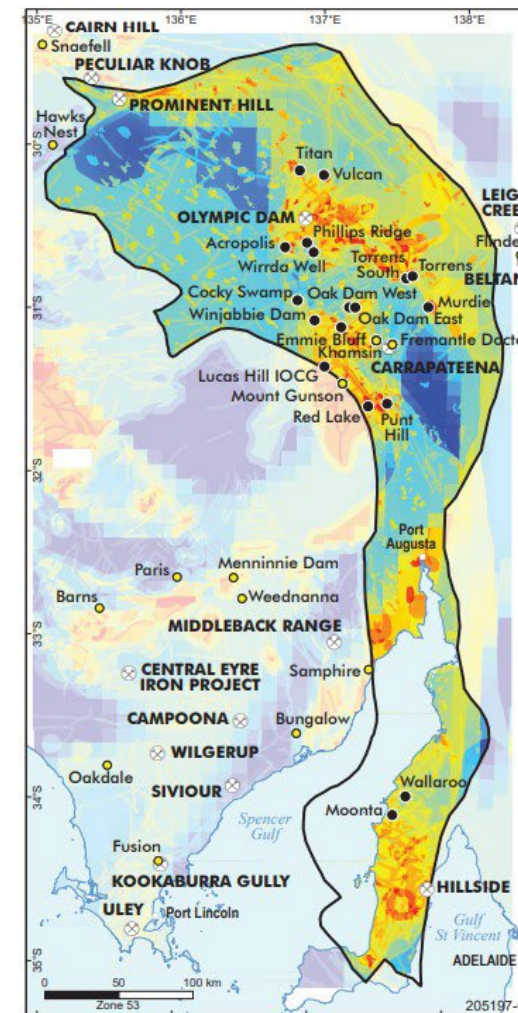
- Prospectivity analysis highlights the potential for undiscovered resources in the eastern Gawler Craton.
- Transforming key geological and geophysical criteria for IOCG deposit formation and preservation allows evidence layers to be summed, and relative potential to be mapped.
- Existing deposits are correctly identified by this methodology as well as un- tested targets with similar characteristics.



Relative potential
Higher Lower



Clustering of gravity anomalies
High-Low Outlier
High-High Cluster
Not Significant Clustering



Relative potential
Higher Lower

Interaction of Natural Gas and Critical Minerals

Together they support the shift to sustainable energy



Contacts

**Dr Bronwyn Camac, Director
Geological Survey South Australia**

Department for Energy and Mining

11 Waymouth Street,
Adelaide, South Australia 5000
GPO Box 320
Adelaide, South Australia 5001
T: +61 8 8xxx xxxx
E: demreception@sa.gov.au

Join at
slido.com
#9390 139

