

OFFICIAL

# AUSTRALIA MINERALS

REALISE THE OPPORTUNITY

## Opportunities for critical minerals from mine waste in South Australia

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Government  
of South Australia  
Department for  
Energy and Mining

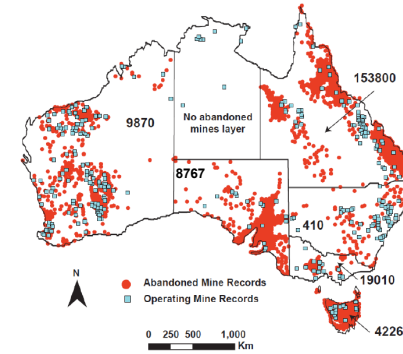
# Stocktake: South Australia's Mine Waste opportunities



- Examining potential of tailings, stockpiles and waste dumps from historic mining operations to host critical minerals content in partnership with MIWATCH team (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**.

# Stocktake: South Australia's Mine Waste opportunities

## MIWATCH & GSSA – desktop study of SA's mine sites



Using 8 criteria to rank SA's 8767 mine sites for their mine waste potential:

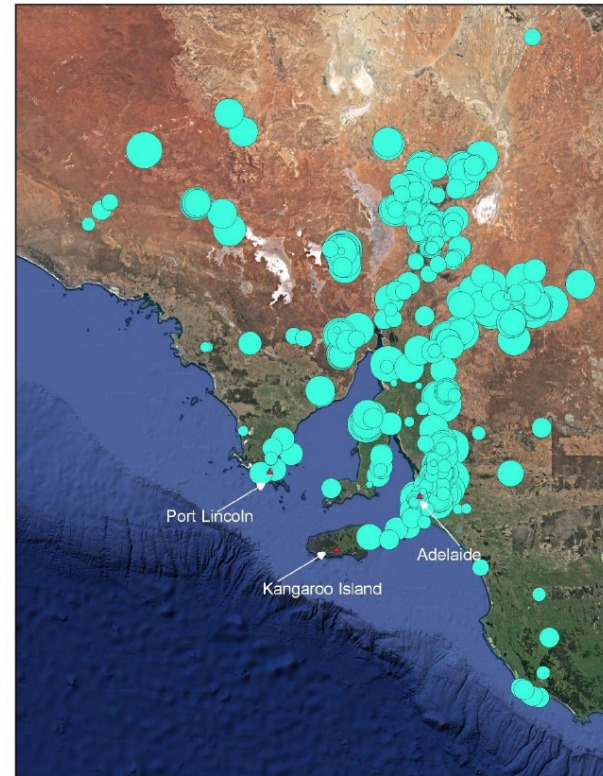
*Mine status – Known commodity – Other/associated commodities – Discovery year – Mine waste features – Distance to major city – Mine site to port – Environmental contamination*

→ ranking used to identify abandoned/historic mine sites with a high probability of containing critical metals in mine waste

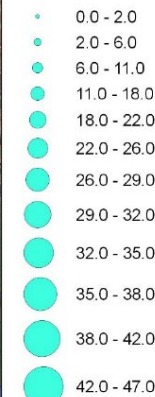


### Secondary prospectivity of South Australia's mine waste: review

Laura Jackson, Alex Corrick, Zhengdong Han, Annah Moyo and Anita Parbhakar-Fox



#### Ranking Results



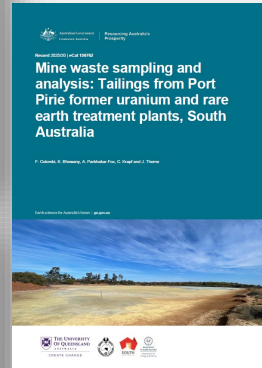
Google Satellite

Rank	MINDEP_NO	DEP_NAME	Description	Score (/50)
1	3137	West Lagoon	Mount Gunson area	47
2	8908	Port Pirie (REE)	Radium Hill waste majority	42
3	3807	Burra	Historic/ tourist site	42
4	3088	Mount Gunson	Mount Gunson area	41
5	4856	Kapunda	Existing company activity	41
6	1933	Mount Grainger		41
7	1927	Paratoo		41
8	5104	Moonta Central Lode	Historic/ tourist site	41
9	3046	Challenger	Care and maintenance	40
10	5136	Moonta Eastern Lode	Historic/ tourist site	40
11	5967	Alma and Victoria		40
12	1025	Dome Rock		40
13	6644	Iron Knob	Existing company activity	39
14	7854	Beltana	Zinc in willemite	39
15	3206	Blinman	Historic/ Tourist site	39
16	842	Mutooroo		39
17	7300	Walleroo		38
18	8256	Burra smelting works	Historic/ tourist site	38
19	962	Radium Hill	Radioactive hazard	38
20	1482	Brukungu		37
21	3057	East lagoon	Mount Gunson area	37
22	3002	Iron Monarch	Care and Maintenance	36
23	4401	Leigh Creek Lobe B		36
24	394	Perseverance		36
25	3051	Cattlegnd	Mount Gunson area	36
26	5208	Wheal Hughes		36
27	8203	Glenloth Government Battery		36
28	3029	Iron Prince	Existing company activity	35
29	3010	Peculiar Knob		35
30	4207	Rossman		35

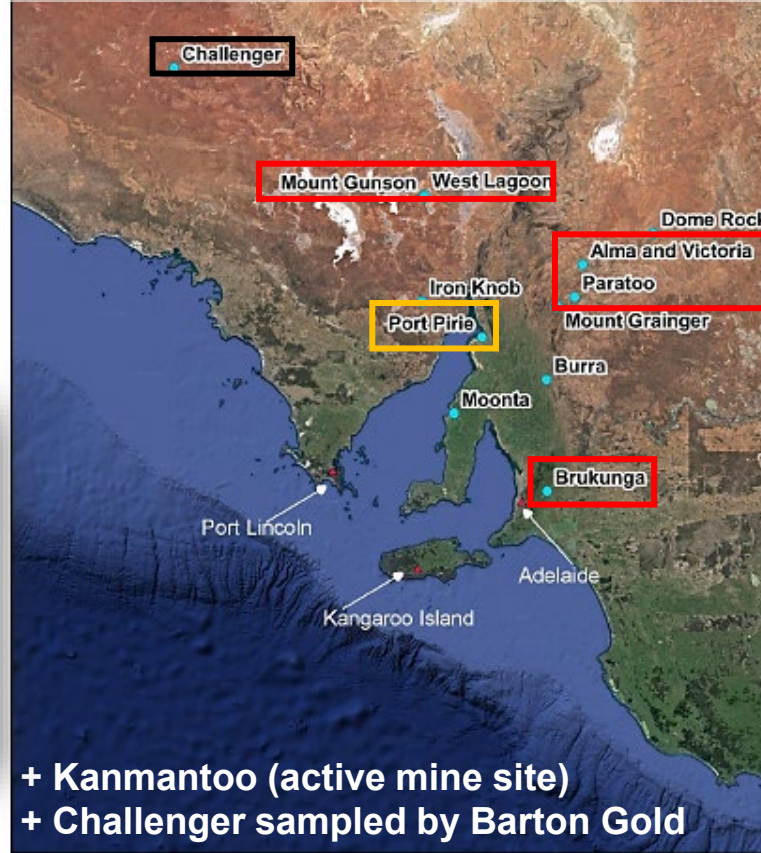
# Mine Waste Study Sites

Mine waste sites sampled:

- **Brukunga**
- **Mount Gunson**
- **Kanmantoo**
- **Alma & Victoria**
- **Paratoo**
- **Port Pirie** (GA national site)



**Top 30 list**  
→ 10 case study side to follow up in detail

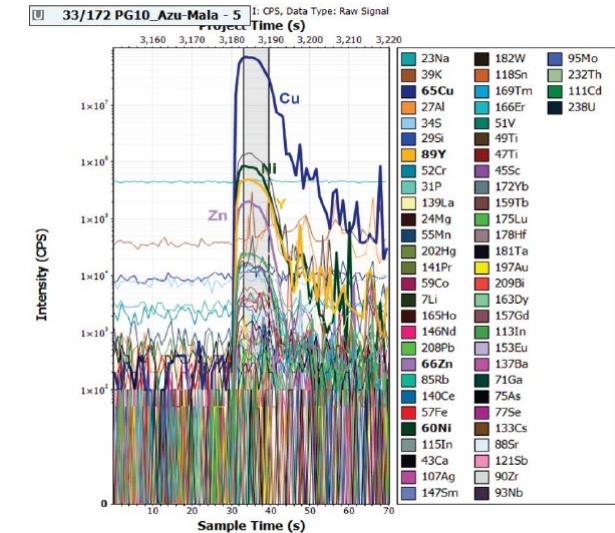
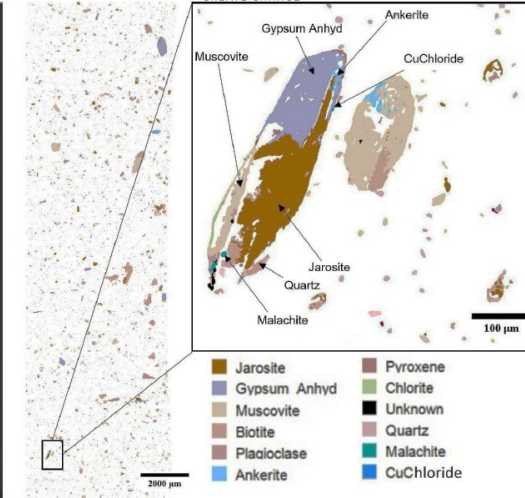
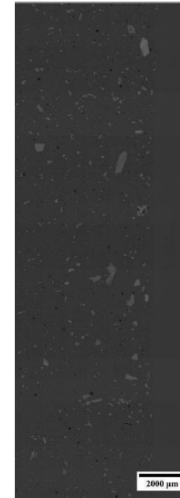
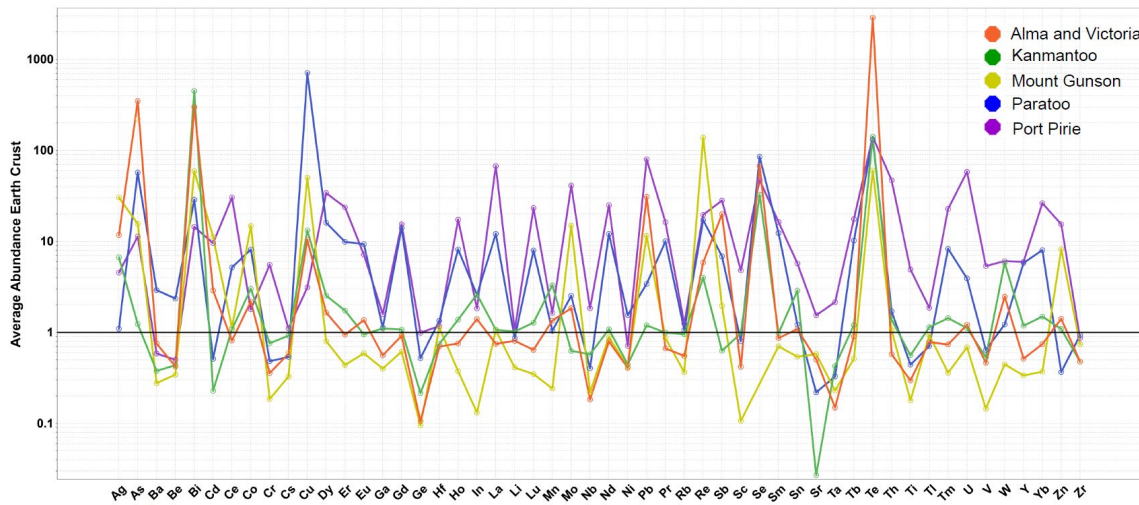
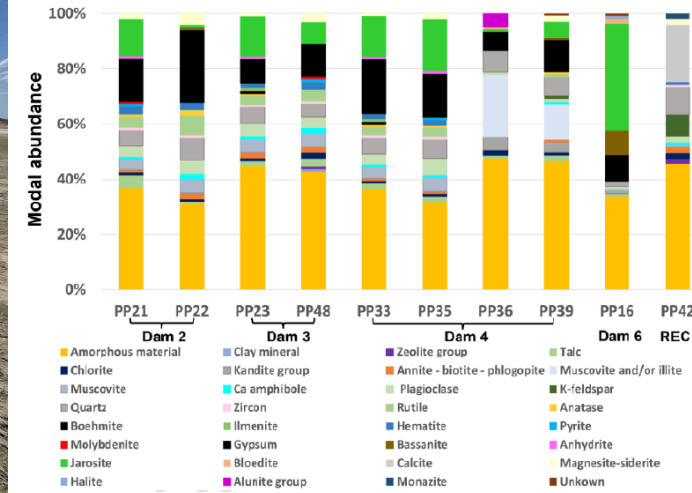


+ Kanmantoo (active mine site)  
+ Challenger sampled by Barton Gold

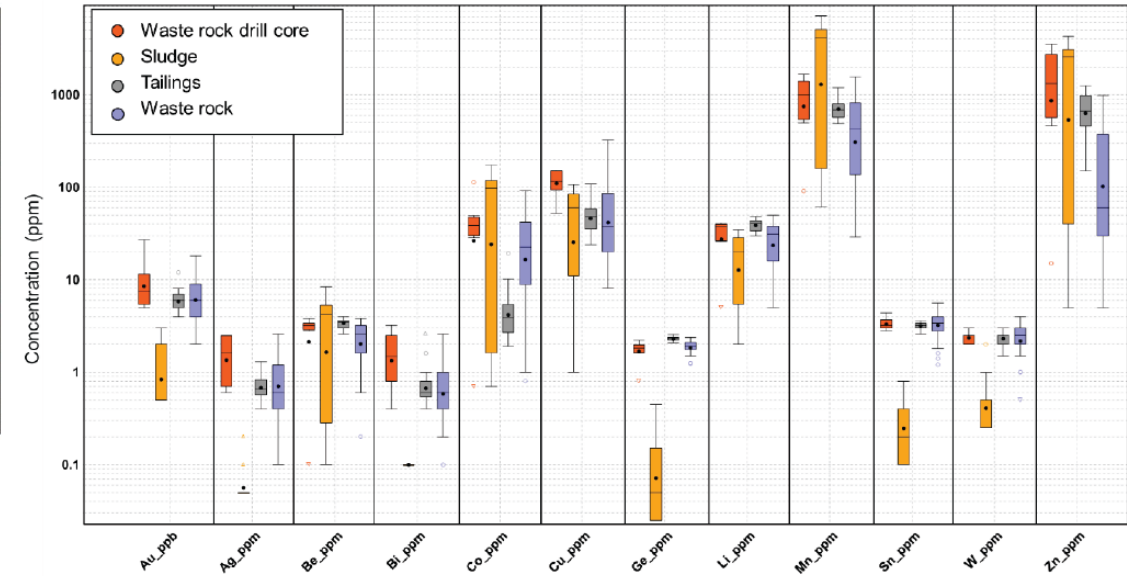
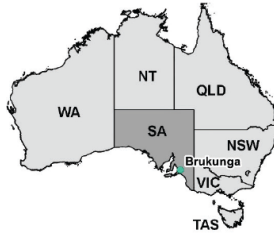
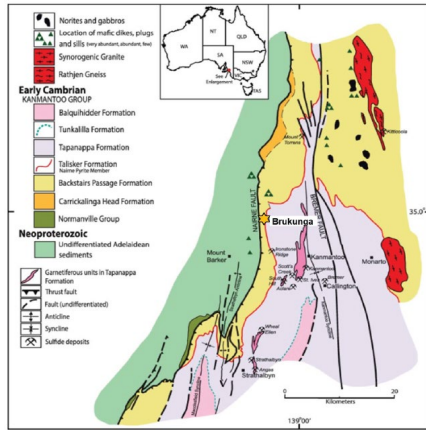
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# Analytical approach for assessing mine waste

- Mine waste sampling
- Chemical assaying (48 elements)
- Bulk and in-situ mineralogy
- Mineral chemistry (meso/micro scale)

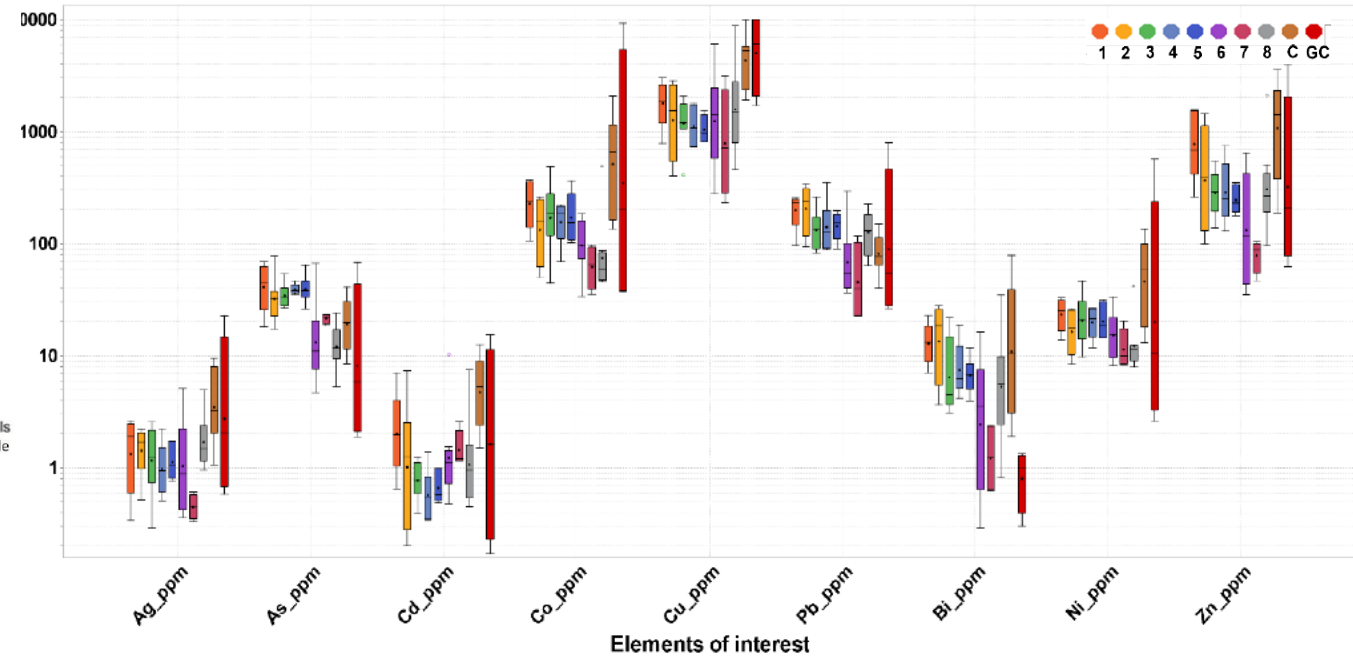
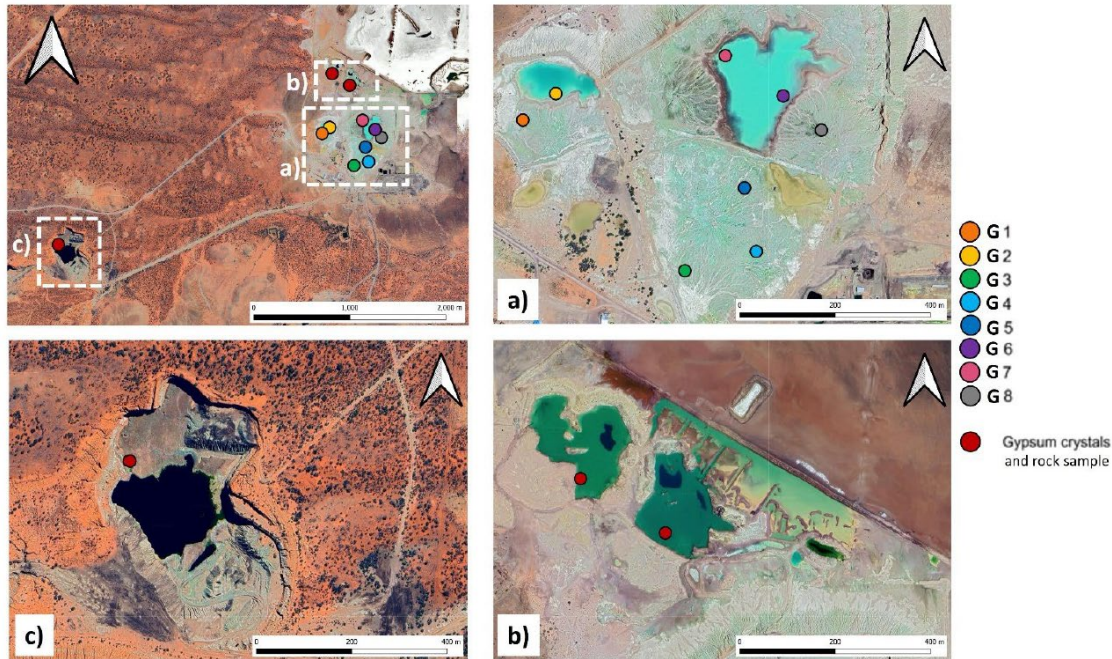


# Results: Brukunga



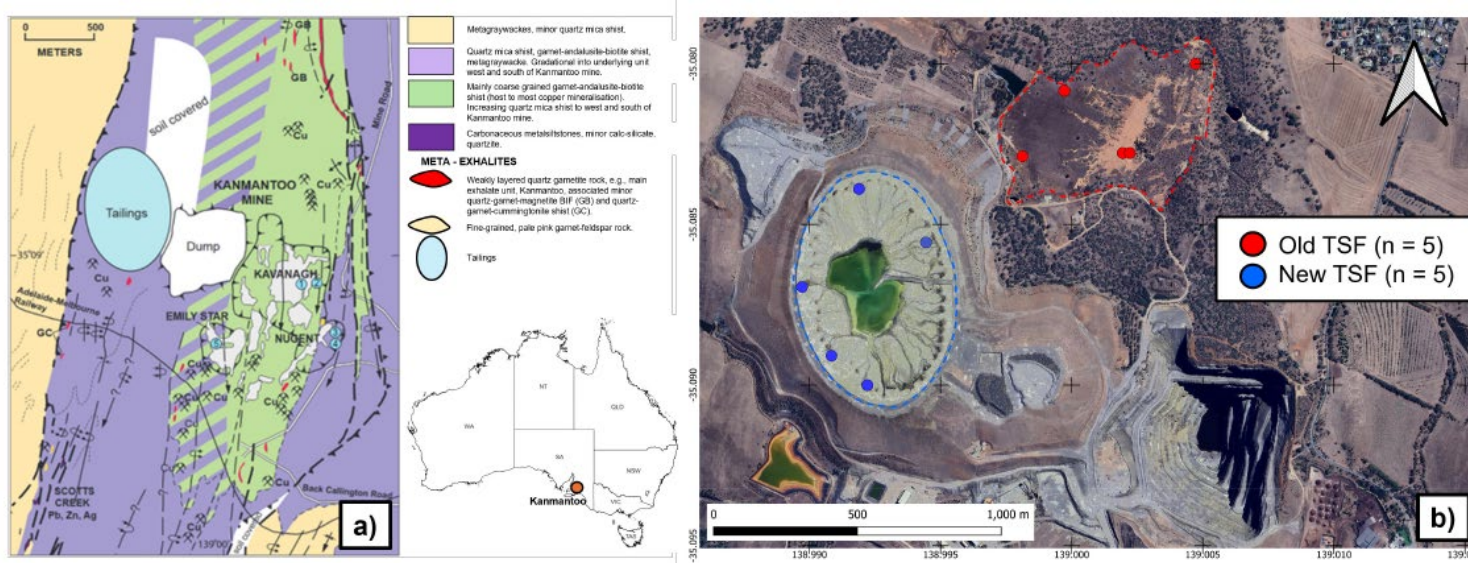
- Highest potential: **Bismuth, Cobalt, Copper, Antimony, Tungsten and Zinc**
- Concentration of sulfide minerals (pyrite average 13 wt. %, pyrrhotite average 7 wt. %) should be considered as a resource to industries that require **sulfuric acid** (e.g., fertiliser production, mineral processing, metal refining).

# Results: Mount Gunson Cu mine



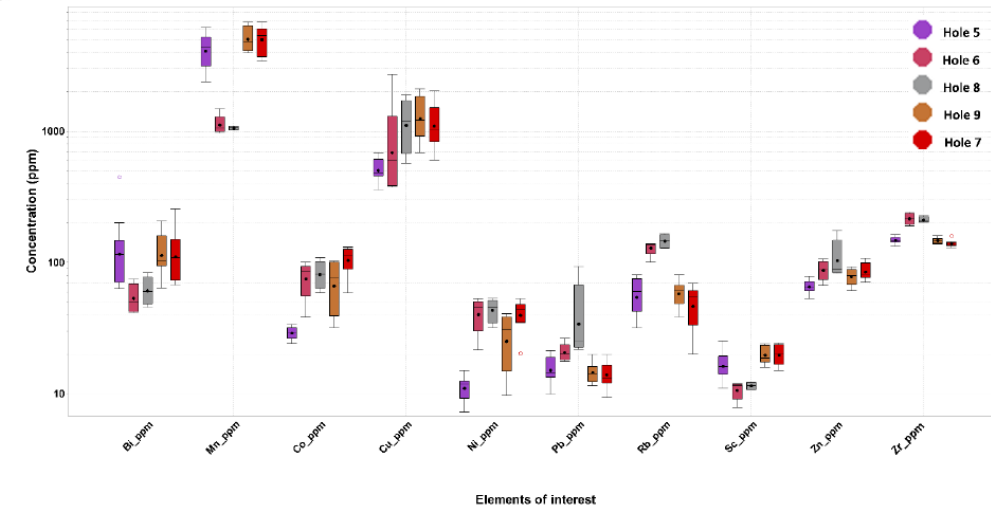
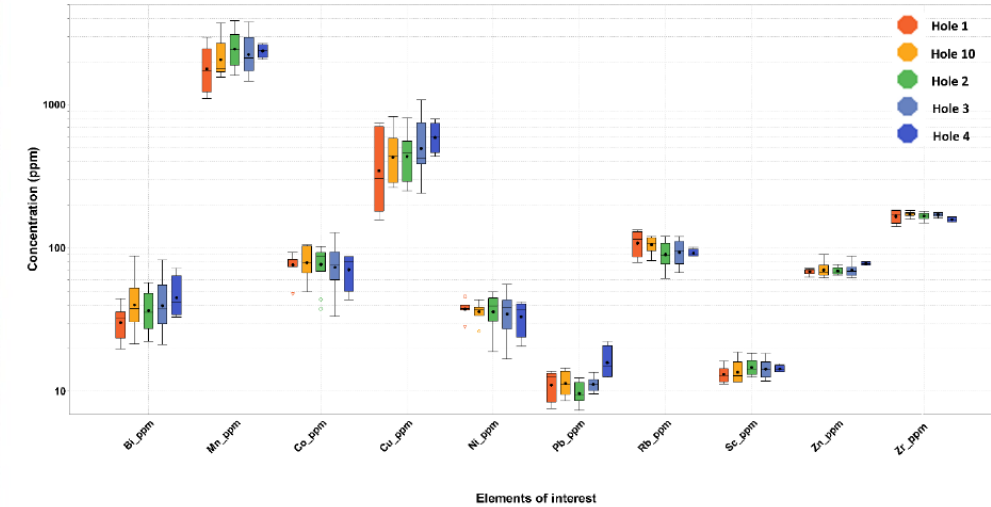
- Highest potential: **Copper, Cobalt, Silver**
- Primary minerals identified by XRD and MLA analyses are quartz and muscovite

# Results: Kanmantoo Cu-Au mine

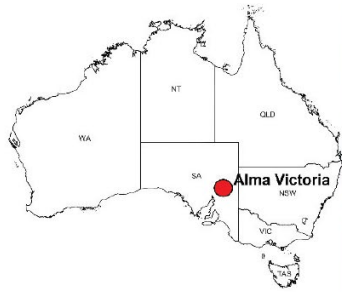


Highest potential:

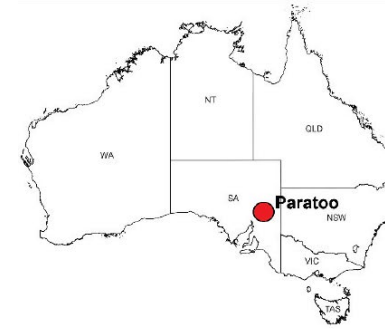
- **Zirconium, Bismuth, Titanium, Manganese** in garnets
- **Copper, Nickel, Cobalt** in iron sulfides
- Primary minerals identified by XRD and MLA analyses are garnet and quartz



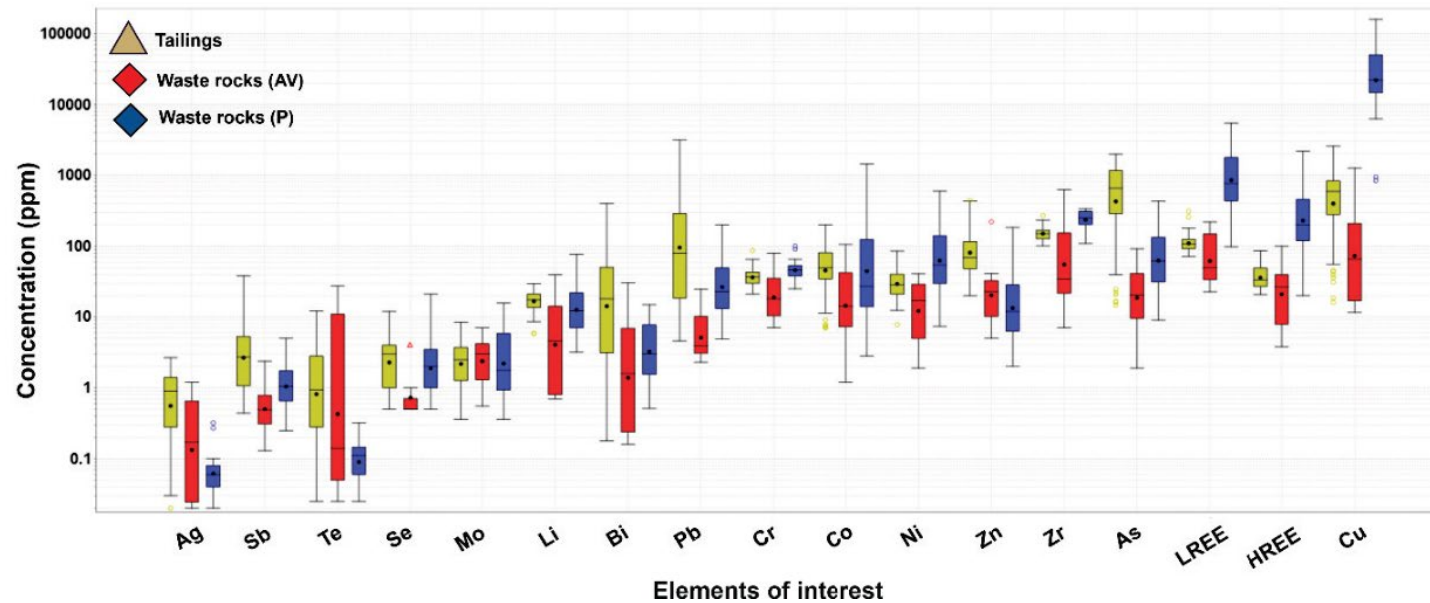
# Results: Alma and Victoria Au mine & Paratoo mine



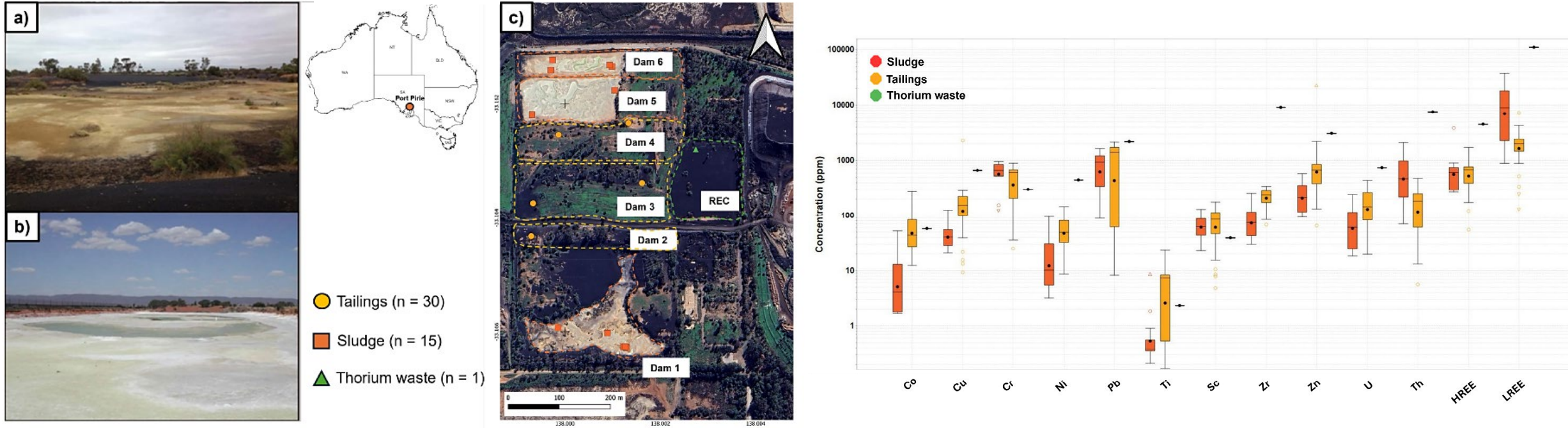
Highest potential:  
Lead, Copper, Arsenic, Bismuth, Cobalt



Highest potential:  
Copper, Cobalt, Arsenic, Light & Heavy REE



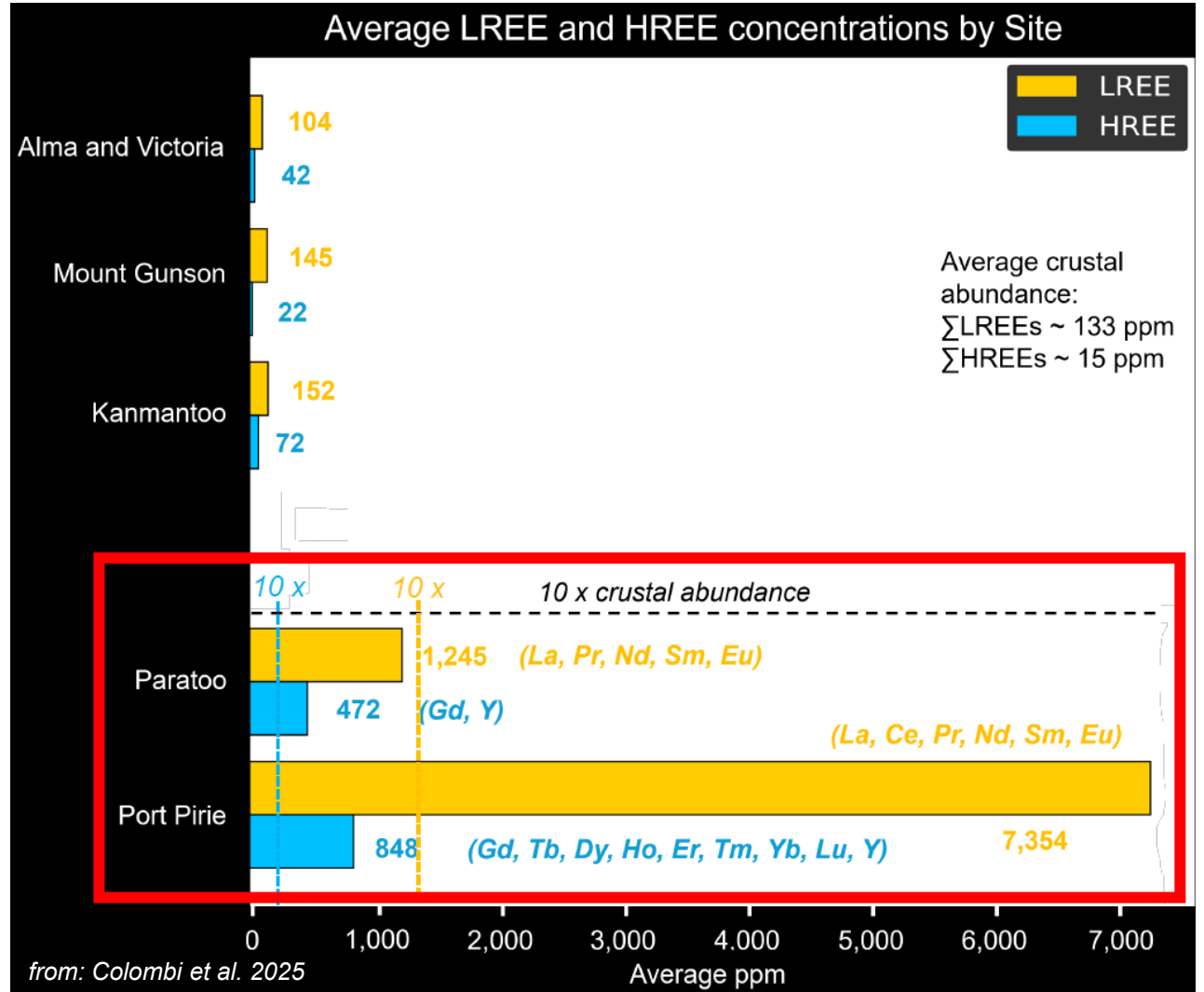
# Results: Port Pirie U and REE treatment facility



- Highest potential: **Zinc, Molybdenum, Lead, Uranium, Thorium, Heavy and Light REE**
- Primary minerals identified by XRD and MLA analyses are gypsum, jarosite, calcite, monazite and amorphous material

# Average concentrations of LREE's and HREE's

- Port Pirie and Paratoo display significant elevated REE's concentrations( >10 times crustal averages)
- REE comparable to lower grade deposits (e.g., Dubbo NSW with 0.3-1% REO)



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Government of South Australia | ENERGY & MINING | South Australia's mine waste ranking | Powered by SARIG

RESET | Feature size: All | Deposit status: All | Discovery year range: All | Major commodity: All | Geochemical associations: All

Name	Mineral deposit link	Mine waste ranking	Commodities	Major commodity	Geochemical associations	Discovery year	Classification code
West Lagoon		47	Copper, Silver, Cobalt	Cu	Cu-Co-Ag-Bi-Au	1895	Deposit
Iron Magnet		43	Iron	Fe	N/A	1930	Deposit
Burra		42	Copper, Dolomite	Cu	Cu-(Co-Ni-Zn-Au-Mo-Fe-U-REE)	1845	Deposit
Iron Duchess South		42	Iron	Fe	N/A	1930	Deposit
Port Pirie Ree		42	Rare Earths, Rutile	REE	N/A	1955	Treatment site
Iron Chieftain		41	Iron, Manganese	Fe	N/A	1933	Deposit
Iron Knight		41	Iron, Manganese	Fe	N/A	1930	Deposit
Kapunda		41	Copper, Rare Earths	Cu	Cu-(REE-Sc-Au)	1842	Deposit

Ranking contributions

Name	Ranking Contributions	Total
West Lagoon - 3137	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (7)	47
Iron Magnet - 8279	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (3)	43
Burra - 3807	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (2)	42
Iron Duchess South - 71...	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (2)	42
Port Pirie Ree - 8908	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (2)	42
Iron Chieftain - 7197	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (1)	41
Iron Knight - 7201	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (1)	41

Location: AUSTRALIA



search for 'fit for purpose' mine waste sites

e.g., REE-associated opportunities

Government of South Australia | ENERGY & MINING | South Australia's mine waste ranking | Powered by SARIG

RESET | Feature size: All | Deposit status: All | Discovery year range: All | Major commodity: All | Geochemical associations: Multiple selections

Name	Mineral deposit link	Mine waste ranking	Commodities	Major commodity	Geochemical associations	Discovery year	Classification code
Burra		42	Copper, Dolomite	Cu	Cu-(Co-Ni-Zn-Au-Mo-Fe-U-REE)	1845	Deposit
Kapunda		41	Copper, Rare Earths	Cu	Cu-(REE-Sc-Au)	1842	Deposit
Paratoo		41	Copper, Rare Earths	Cu	Cu-(Au-REE)	1888	Deposit
Olympic Dam		39	Copper, Silver, Gold, Iron, Rare Earths, Uranium, Uranium Oxide	Cu	Cu-Au-Ag-U-Fe-(REE-Ba-F)	1975	Deposit
Parabarana		38	Copper	Cu	Cu-Mo-Au-(U-REE-As-Pb-Zn-Bi-Co)	1863	Deposit
Radium Hill		38	Uranium, Mica	U	U-Ra-(RFF)	1906	Deposit

Ranking contributions

Name	Ranking Contributions	Total
Burra - 3807	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (2)	42
Kapunda - 4856	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (1)	41
Paratoo - 1927	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (1)	41
Olympic Dam - 3000	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (9)	39
Radium Hill - 962	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (9)	39
Parabarana - 3203	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (8)	38
Weekeroo - 892	Associated commod ran... (10), Discovery year ranking (10), Feature ranking (10), Known commod ran... (10), Mine status ranking (10), Other ranking cont... (8)	38

Location: SOUTH AUSTRALIA

# Contacts

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