

DIG DEEPER
Webinars

**INNOVATION THROUGH
DEMONSTRATION AND
TRIAL SITES**

DR ELISE BEKELE | 3-JUNE 2022

The Team

Project Team



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The Problem:

Lack of a descriptive catalogue of national mine sites* available for potential demonstrations of technologies and approaches to aid mine closure and to document past closure activities (lessons learnt) and post-closure activities

***Sites to demonstrate a range of key issues and challenges (e.g., post-closure site ownership, revegetation efforts, waste rock landforms) and representative of different conditions across Australia**

Research and innovation need to be demonstrated at the correct scale to encourage adoption, uptake and use.

The Research Process

To gather relevant information and recommendations, a range of tasks were undertaken:

1. A search of publicly available information on mine sites and their environmental and community setting and their condition
2. A CRC TiME partner survey to provide broader views of factors relevant to selection of possible demonstration mines sites
3. Interviews with 13 mining companies to ascertain details of mine sites and condition, including previous rehabilitation efforts, and industry intent around some mine sites
4. Interviews with government agencies to ascertain details of mine sites and closure issues of concern to them, and to identify approaches to abandoned legacy mine sites.

Slides 6 – 15 are a subset of the Final slides presented on 3-June 2022.

The final Power Point presentation contains several types of animation that are available in “Slide Show mode” to allow the user to hover over sites and obtain more information using interactive legends (hyperlinks to other slides), balloon text with more location information, roll-over text, etc. Since these are not accessible in this *PDF version, only a subset of these are provided in this document.

To access the database, please download Project Outputs available from CRC TiME using this link to this project:

<https://crctime.com.au/research/projects/project4c/>

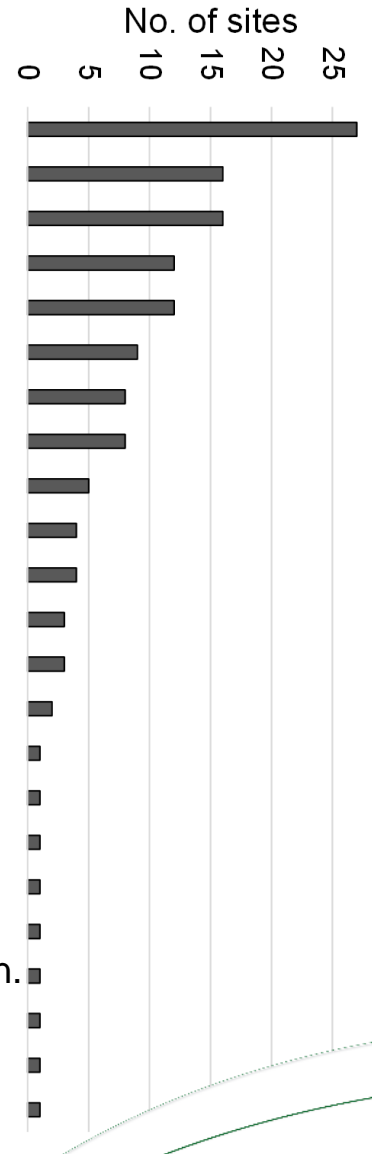
Large dataset (105 sites)



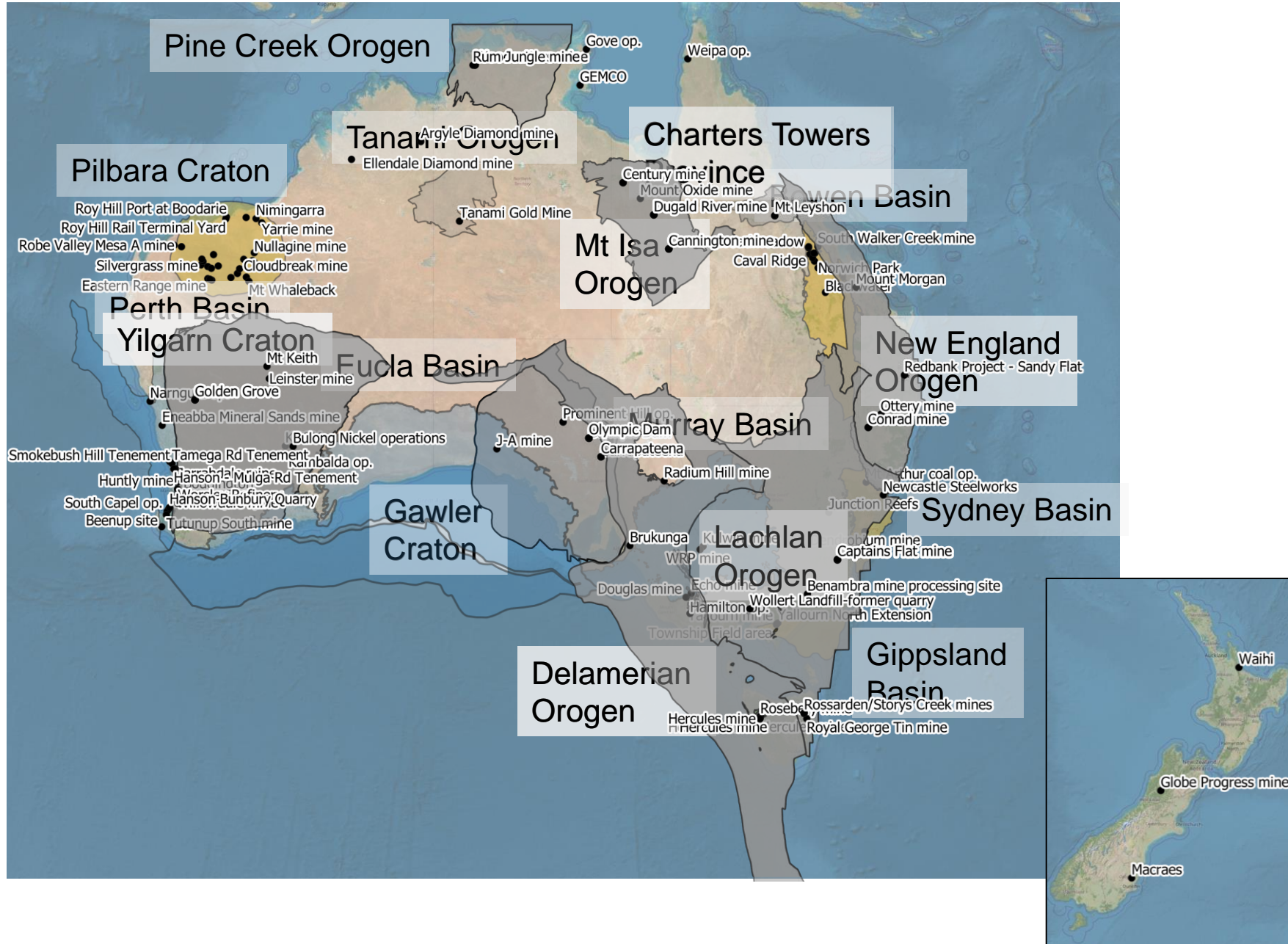
Site owners	
●	Government (abandoned site)
●	Alcoa of Australia, Ltd
●	BHP and BHP Nickel West
●	Energy Australia
●	Fortescue Metals Group
●	Hanson Construction Materials
●	Iluka Resources Ltd
●	MMG Ltd
●	Newmont
●	OceanaGold
●	Oz Minerals
●	Rio Tinto
●	Roy Hill
●	South32

Geologic provinces and resources at site locations for large dataset (105 sites)

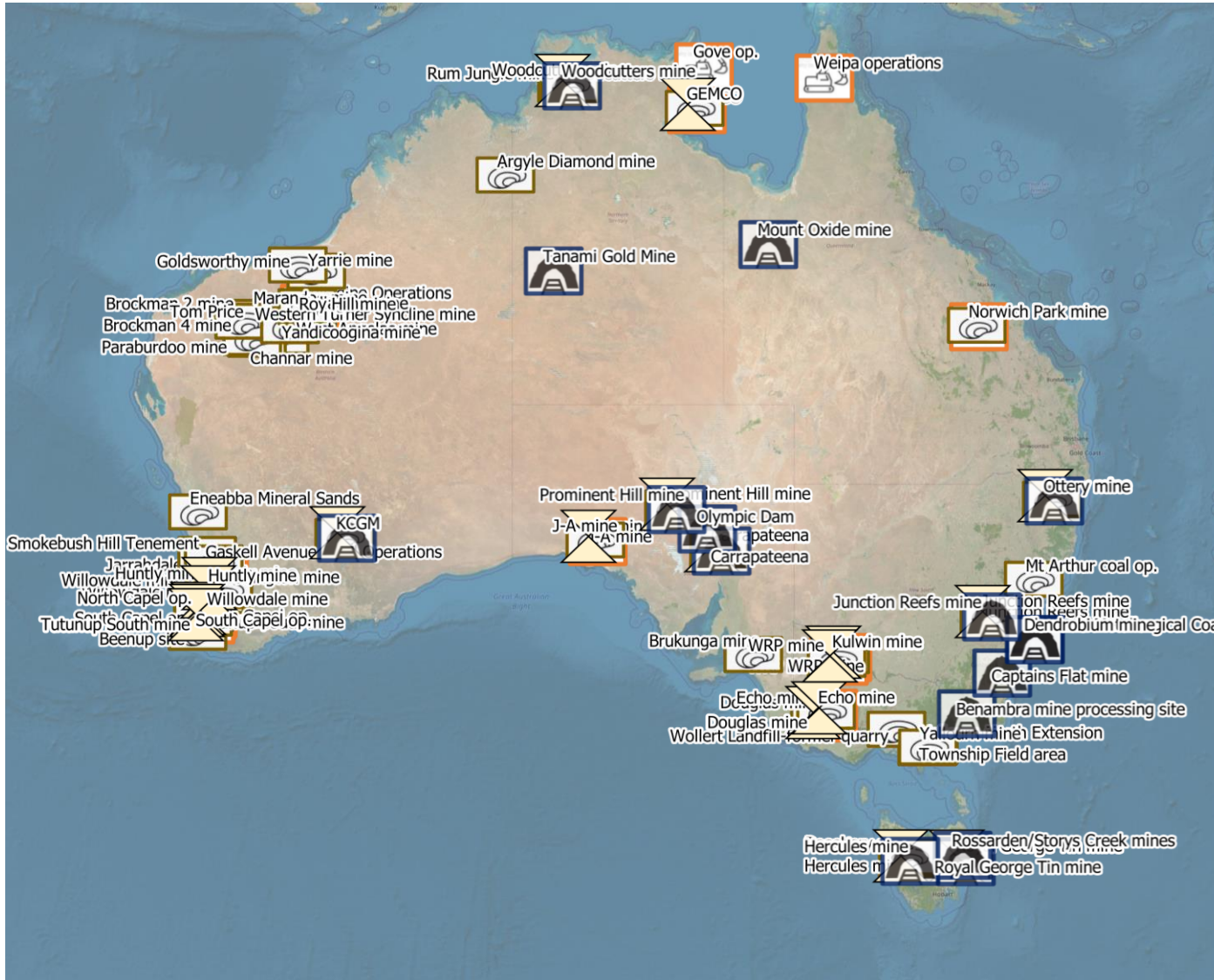
Resource



- Iron ore
- Coal
- Gold
- Copper
- Mineral sands
- Zinc
- Lead
- Silver
- Bauxite
- Nickel
- Sand
- Tin
- Uranium
- Diamond
- Al refining
- Arsenic
- Basalt aggreg.
- Basalt rock
- Base metals
- Iron sulfide min.
- Manganese
- Steel works
- Tungsten



Large dataset (105 sites)



Mine type	
	Open-cut
	Underground
	Strip
	Both underground and open-cut or strip



Note: for some mine sites the information is incomplete and would need further investigation and collation

Large dataset (105 sites)



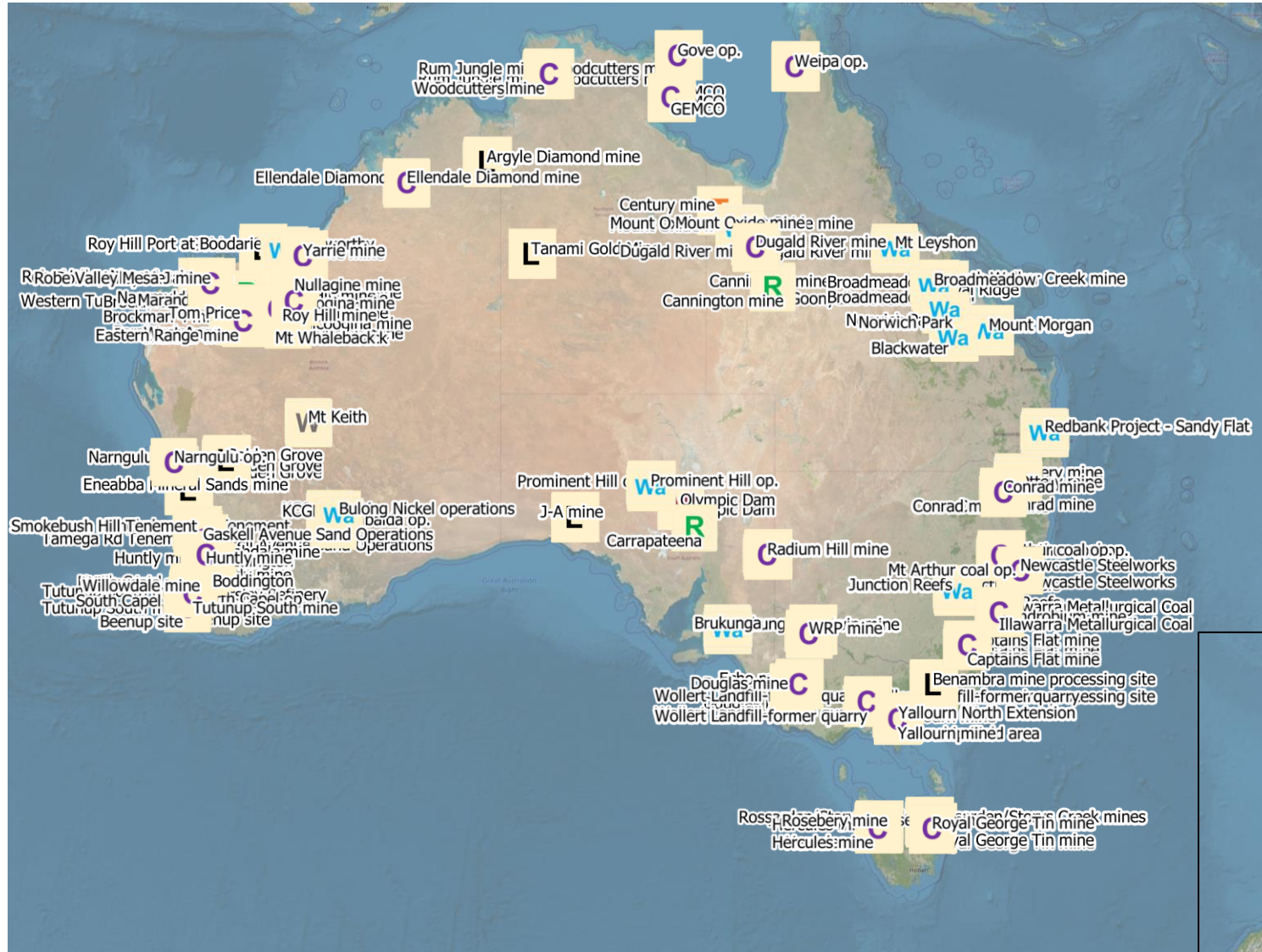
Site operating status	
●	Abandoned
●	Closed
●	Operating



Key challenges and issues at sites to showcase

- Waste rock dumps
- Final voids
- Tailings and pond facilities
- Potential acid forming materials
- Final landforms, landform reshaping
- Revegetation
- Water management
- Community preferences
- Transitions to post-mining economic benefits

Large dataset (105 sites)

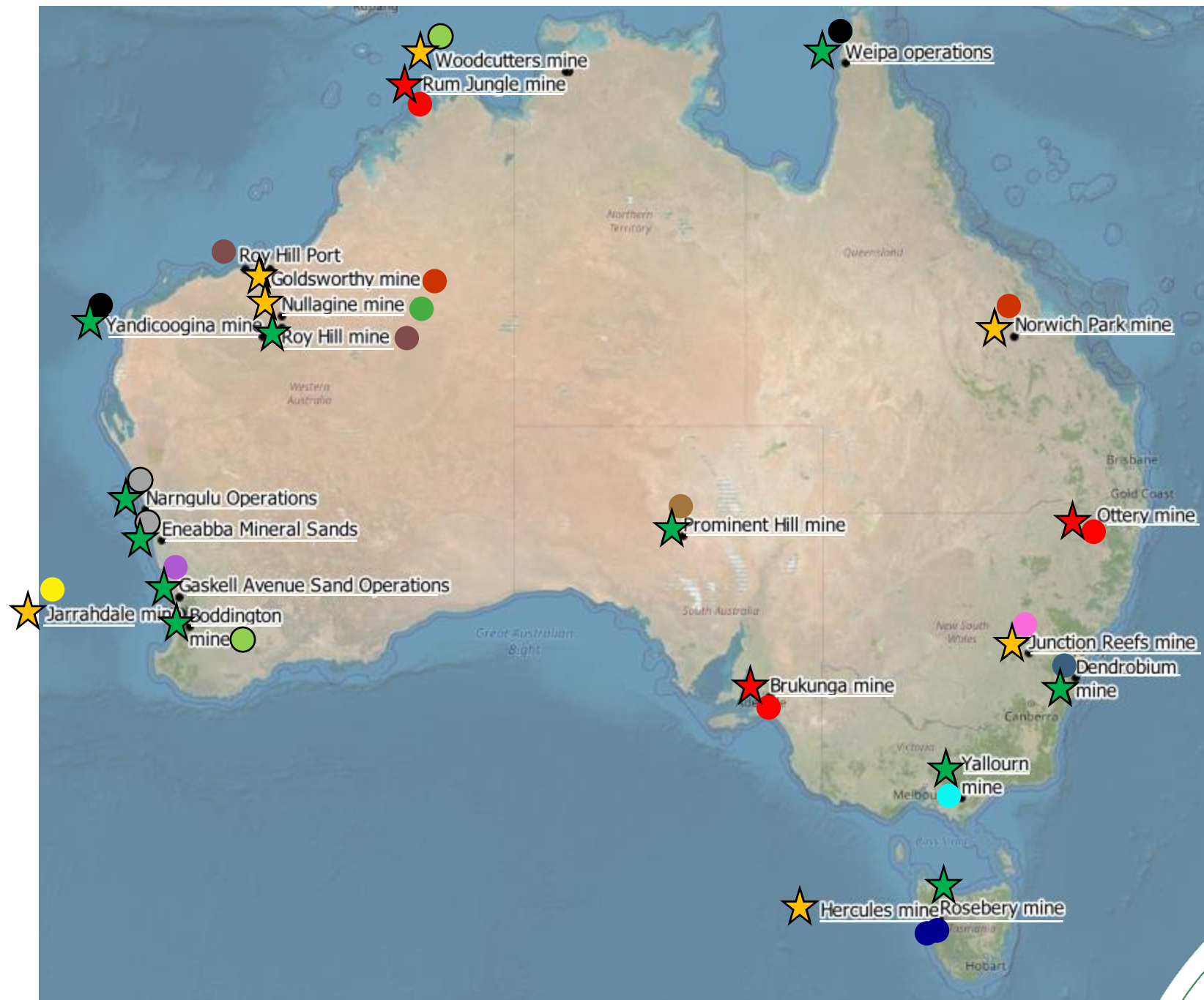


Features	
T	Tailings storage facilities
A	Acid mine drainage
V	Voids, pits, and/or ponds
W	Waste rock dump
R	Rehabilitation
L	Landform design
Wa	Water issues
C	Community links



Note: for some mine sites the information is incomplete and would need further investigation and collation

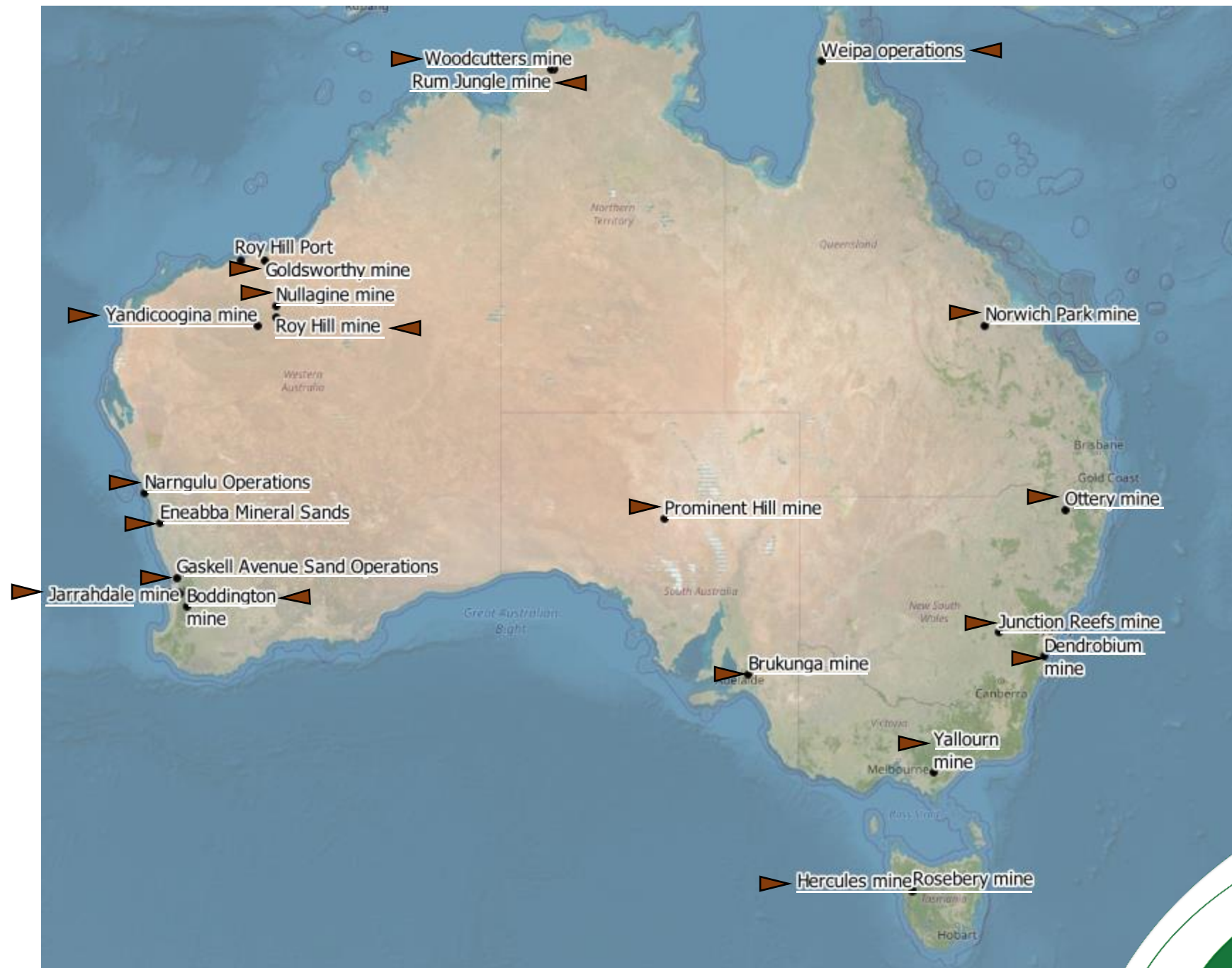
Location, site owner, resource (☆) and operating status for 20 sites



Site owners	
●	Government (abandoned site)
●	Alcoa of Australia, Ltd
●	BHP Billiton
●	Energy Australia
●	Fortescue Metals Group
●	Hanson Construction Materials
○	Iluka Resources Ltd
●	MMG Ltd
●	Newmont
●	OceanaGold
●	Oz Minerals
●	Rio Tinto
●	Roy Hill
●	South32

Site operating status	
★	Abandoned
★	Closed
★	Operating

Climate Information



EXAMPLES OF TECHNOLOGIES/APPROACHES TO AID TRANSITIONING TO (AND BEYOND) CLOSURE

- Waste rock **dump erodibility trials** with different types of rock armouring (e.g., Boddington mine)
- **Acidic and metalliferous issues** - formation, treatment, mitigation (e.g., Brukunga mine)
- Opportunities for **reuse of underground workings** for water storage and pumped hydropower (e.g., Dendrobium mine)
- Novel methods for propagation of native flora, **improving propagation success for recalcitrant flora** species (e.g., Eneabba Mineral Sands mine)
- **Remote monitoring** of rehabilitation (e.g., Goldsworthy mine), and mapping of vegetation cover (e.g., Roy Hill mine)



- Potential for **reprocessing tailings** to recover value and reduce overall legacy and rehabilitation needs (e.g., Rosebery mine)
- Rehabilitation to re-establishing a **self-sustaining jarrah forest** ecosystem (e.g., Jarrahdale mine)
- **Passive wetland treatment** to capture metal discharges (e.g., Junction Reefs mine)
- **Optimal capping** strategy for tailing storage facilities and tailings pond cover liners (e.g., Narngulu operations)
- **Rehabilitation of strip-mined** areas typical of hard coal regions (e.g., Norwich Park mine)
- **Showcasing the consultative process**, e.g., funding provided by Newmont to stakeholders to develop business cases for economic, post-mining land use options for different domains at Woodcutters mine

Key Deliverable

A broad range of mine sites have been identified and described – that offer potential for demonstration sites in CRC TiME projects.

- operational open and closed mines, and abandoned mines and quarries
 - all states and the Northern Territory of Australia; near urban centres and regional
 - a range of climate conditions (arid to tropical)
 - hard rock to sand and sedimentary geologies
 - quarry resources to iron ore, including a range of minerals and coal
- Key challenges at these sites and potential future focus areas and projects have also been outlined. Potential research areas are broad across waste rock dumps, final voids, tailings and pond facilities, potential acid forming materials, final landforms, revegetation, landform reshaping, water management, community preferences, and transitions to post-mining economic benefits.

How can Industry use these Findings?

The catalogue of demonstration sites provide a means for subsequent focused conversations to fit new or existing technologies and approaches to possible candidate sites and issues for further upscaling and demonstration.

Innovators in the CRC have a direct pathway to work with partners to present and demonstrate the benefits and value of technologies and solutions for faster uptake and adoption and improved closure outcomes.

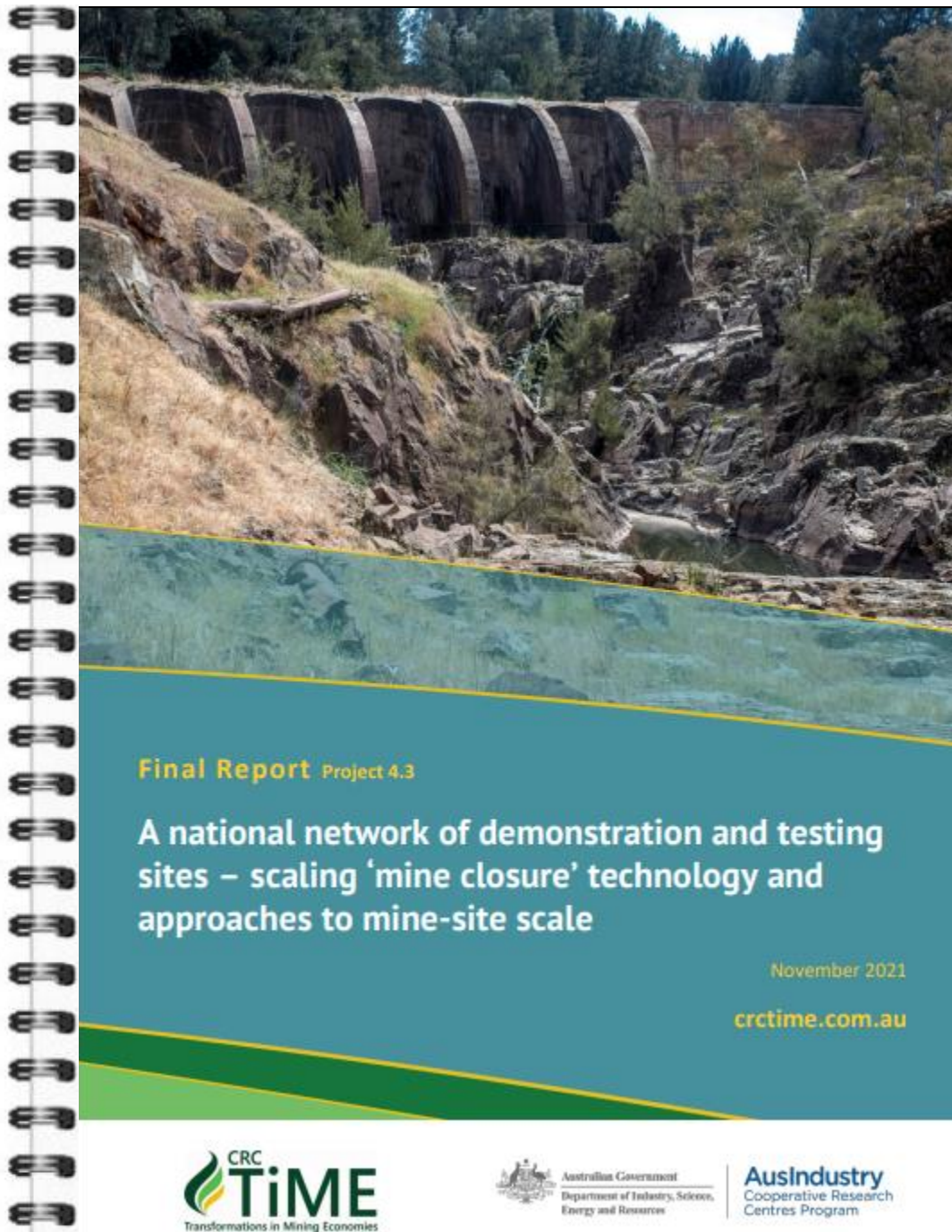


Implications

- Important that knowledge, technologies and solutions emerging from the CRC Research Programs are scalable, market ready, and field transferable.
- New project and initiatives in CRC TiME recognise the importance of research translation to change through partner demonstrations or case studies sites.

For example:

- Improved prediction, remediation and closure of acid and neutral metalliferous drainage (AMD/NMD) sites by examination of mine waste behaviour at the meso-scale. Management of waste materials from multiple sites of interest in Australia, USA, Canada and Malaysia, covering a range of climatic conditions from desert to cool and wet climates to sub-arctic (Commenced March 2022; Project leader: Dr Sarah Harmer, Flinders University).
- Evidence for effectiveness of climate-adapted seed sourcing strategies for revegetation success and transition to mine closure in a changing climate. Study site selection to occur at mines in WA, NT, Qld, SA, Tas (Commences July 2022; Project leader: Dr Suzanne Prober, CSIRO)
- CRC TiME National mine pit lake water assessment and management initiative: risk prioritisation and regional opportunities. Multiple model systems and mine site/regional case settings across Australia (Project proponents: CSIRO, ChemCentre, Curtin, Flinders Uni, UQ, UWA; <https://crctime.com.au/summary-of-initiatives/>).



Final report and links to download additional resources delivered for this project available at:

<https://crctime.com.au/research/projects/project4c/>

PROJECT PARTNERS:





THANK YOU

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