

# Victoria's pre-competitive geoscience: who, where and why

AIG Victoria Minerals Roundup

23 June 2022

**GEOLOGICAL  
SURVEY OF VICTORIA**

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Manager Minerals Geoscience



# About the Geological Survey of Victoria

**The Geological Survey of Victoria (GSV) is the State's geoscience agency. It sits within the Department of Jobs, Precincts and Regions.**

**The GSV is responsible for understanding Victoria's geological framework through regional geoscientific investigations, particularly to enable the informed and integrated management of State-owned resources.**

**For over 169 years, GSV has studied and mapped the surface and sub-surface of Victoria. Today, it provides evidence-based knowledge and information to Government, industry, academia and the community, using the latest geoscience technologies and methods.**

**GSV staff come from a range of geoscientific disciplines, providing an authoritative and in-depth knowledge of our dynamic planet.**

# State of Discovery: <sup>OFFICIAL</sup> Mineral Resources Strategy

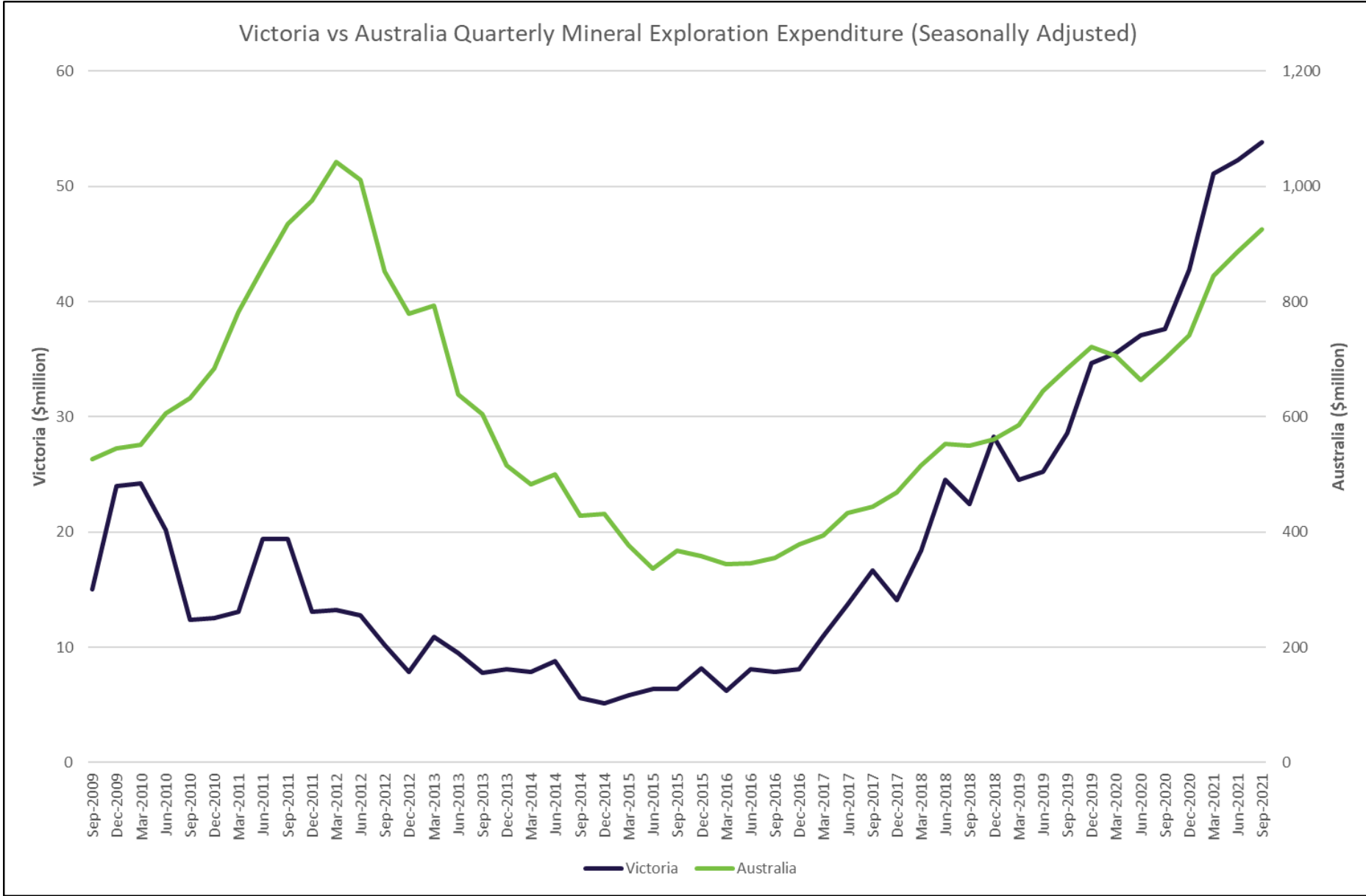
## Five Action Areas

1. Confident communities and responsible explorers
- 2. Advancing geoscience and encouraging mineral exploration and development**
3. Victoria as a global mining hub
4. Improve regulation practice and industry compliance
5. Deliver modern, fit-for-purpose laws



# Unprecedented investment and drilling

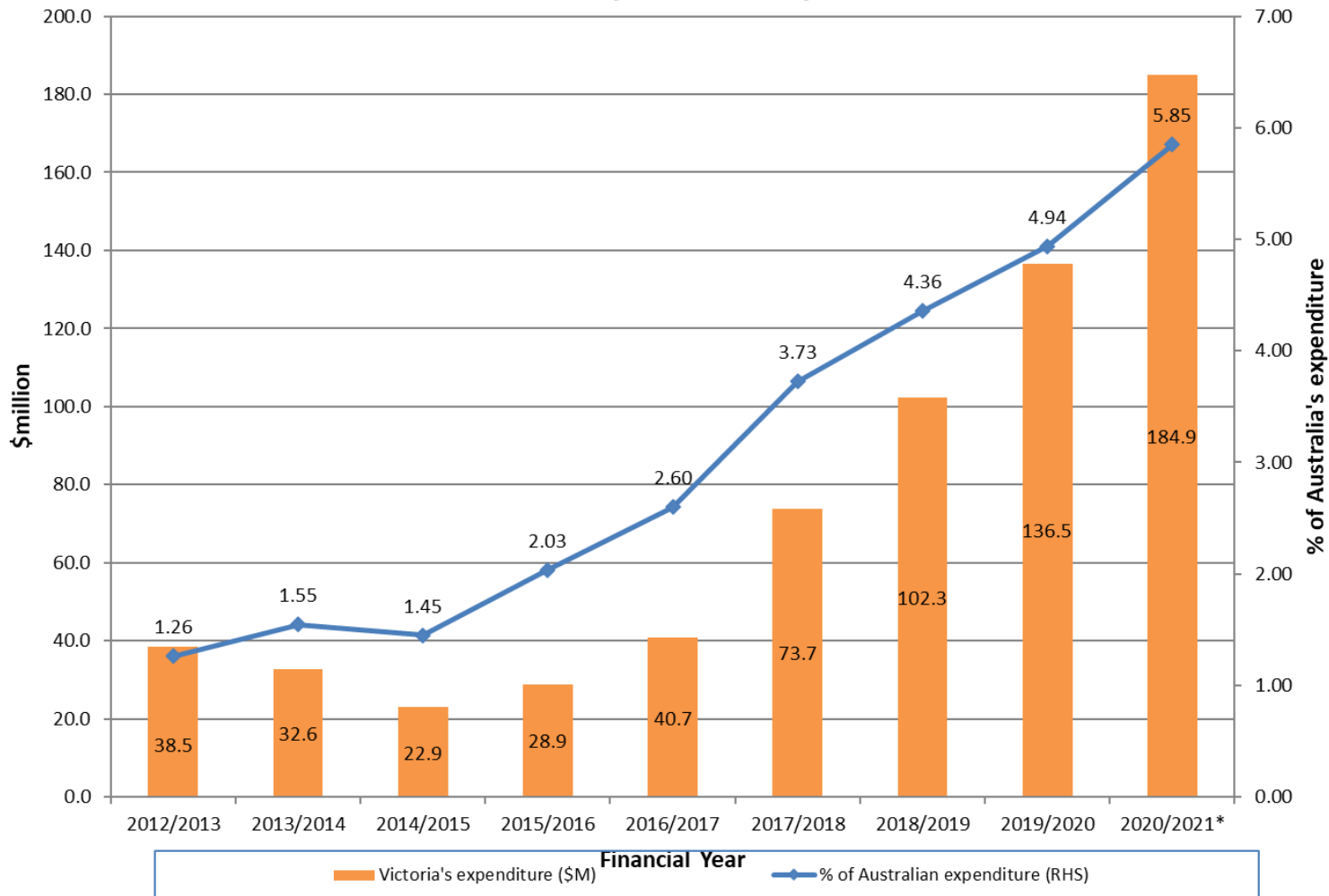
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Source: Australian Bureau of Statistics

# Increasing mineral exploration activity

### Victoria's mineral exploration expenditure - Since 2013



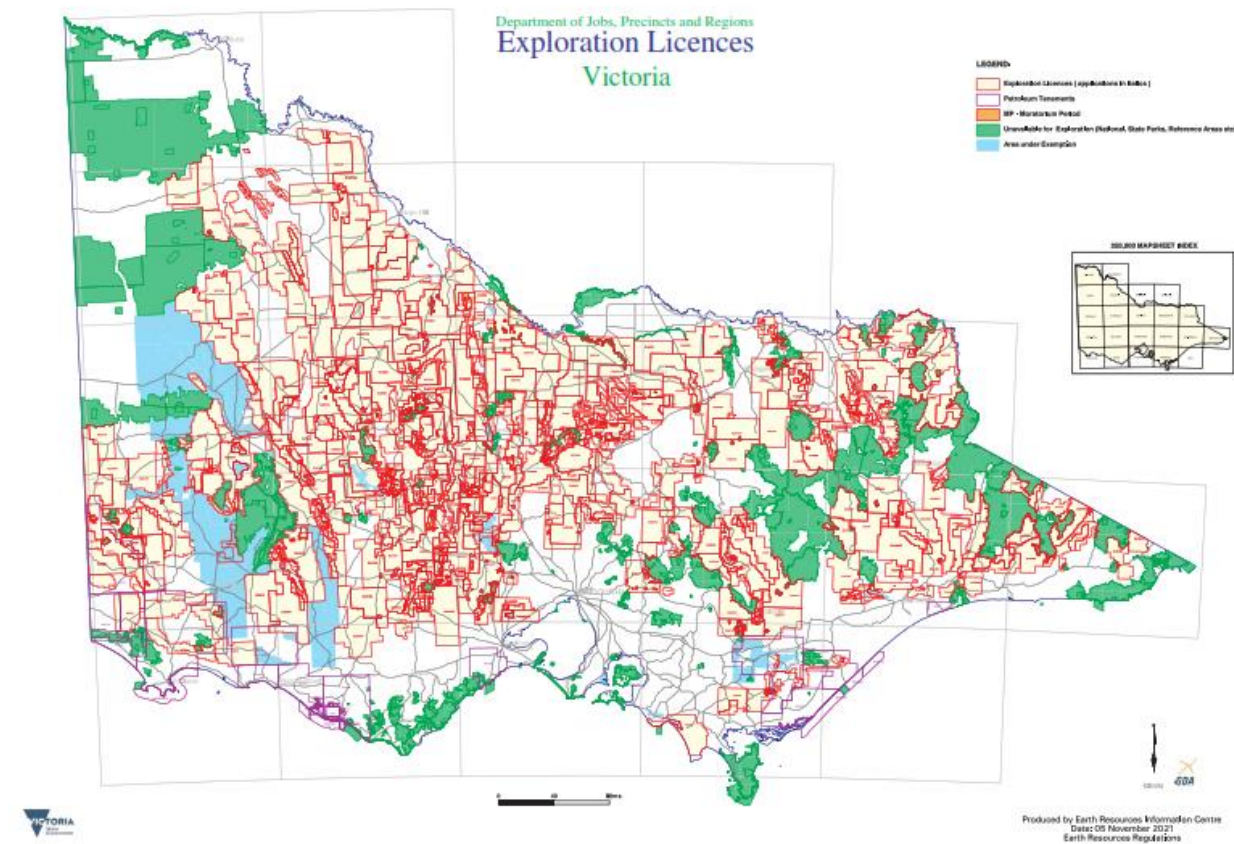
Year	Drill metres
2012/2013	177,077
2013/2014	133,596
2014/2015	87,321
2015/2016	147,164
2016/2017	191,658
2017/2018	191,229
2018/2019	348,192
2019/2020	388,662
<b>2020/2021</b>	<b>467,585</b>



# Summary

## *Victoria's resources sector is going from strength to strength (FY21)*

- \$184.9m mineral exploration expenditure
- ~5.8% of Australia's mineral exploration expenditure
- ~57% mineral tenement coverage
- ~413,000 meters drilled
- 101 Mineral licences granted
- 21 Mineral licences renewed
- 13,895 new Miner's Rights created



# Geoscience data

## Pre-competitive data and knowledge

- >250,000 free records: maps/reports/data
- [GeoVic](#): online GIS application
- [Presentations and papers](#)

## Geology

- Seamless: [1:250k](#) and [1:50k](#)
- [3D model full crust 1:250k](#)

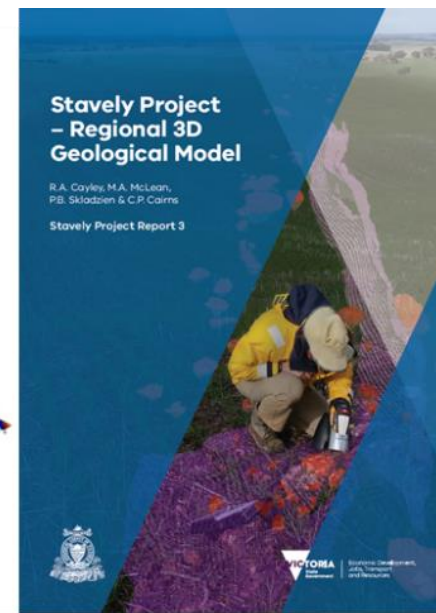
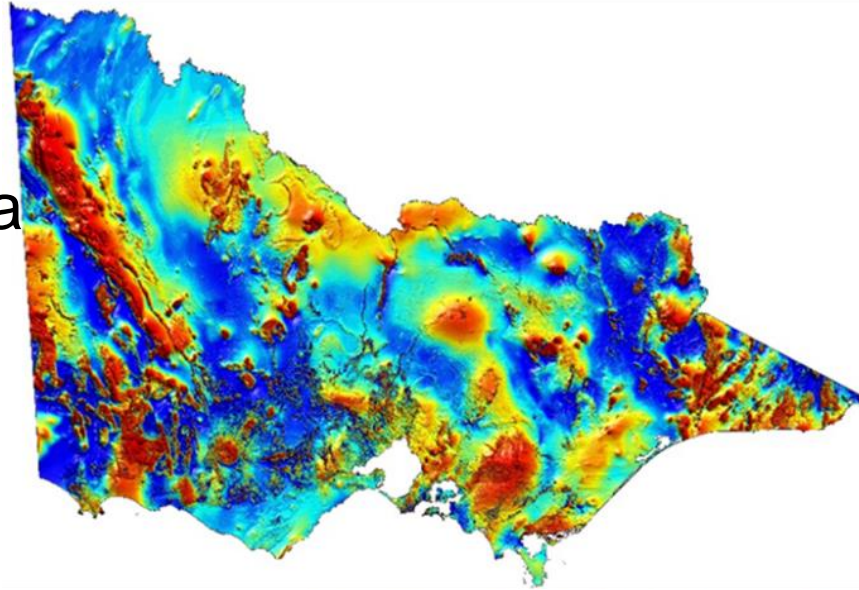
## Geophysics - Modern state-wide

- Magnetics: 200-400 m line spacing
- Ground gravity: 1.5 km nominal spacing
- Deep 2D seismic reflection transects

## Drill Core Library

- ~1.5 million metres drill core/cuttings
- [>14,000 drill holes](#)

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# GSV Minerals Program

## State of Discovery: Mineral Resources Strategy 2018-2023

*Action Area 2: Advancing geoscience and encouraging exploration and development*

2022 priorities





# Mineral Tenements/Information

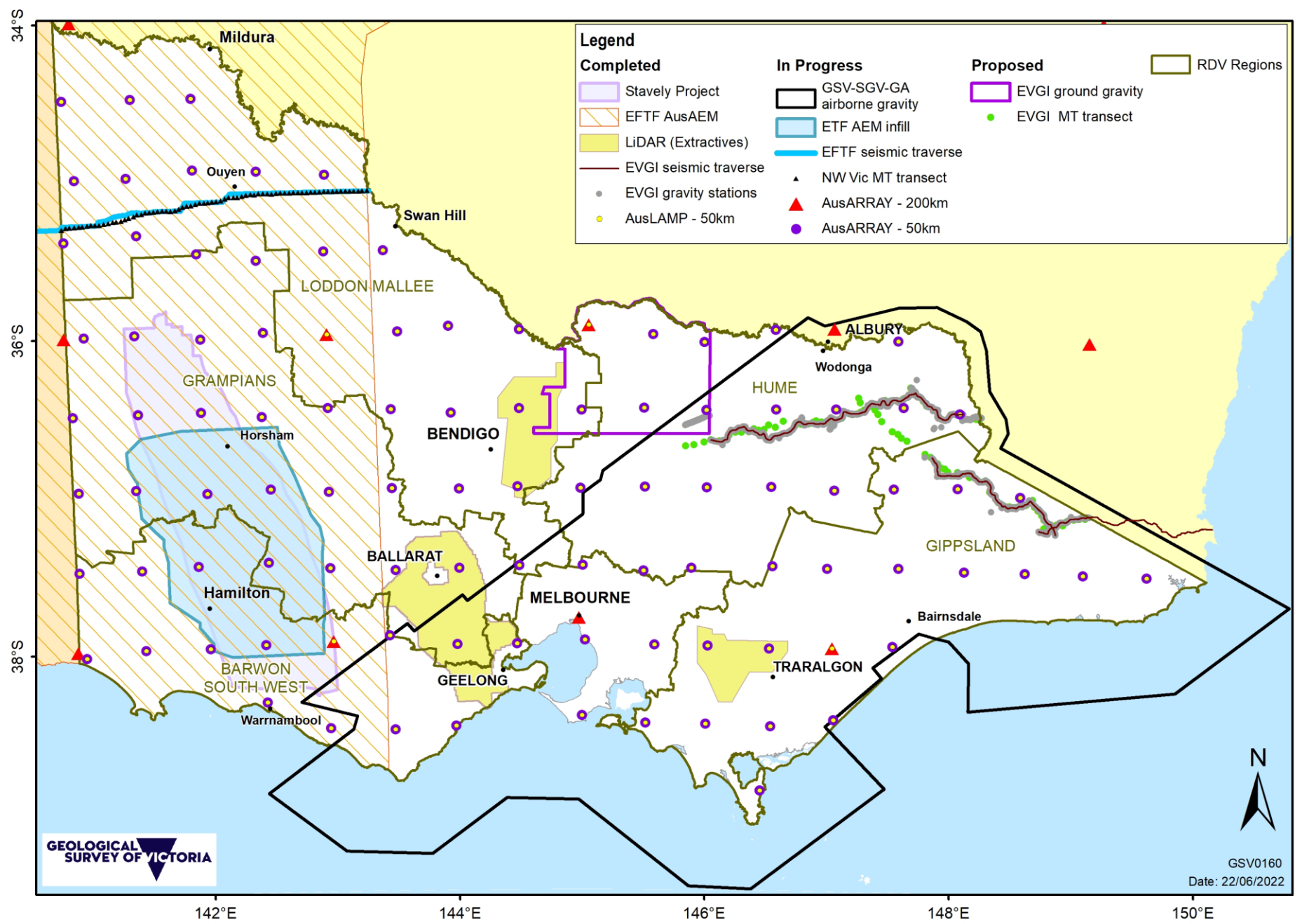
- Scoping an industry engagement session(s)
- Very early-stage planning – multiple sessions? In person?
  - Meet the team
  - [Exploration submission guidelines](#) review – support/feedback
    - **Include geophysics**
  - GeoVic - support/feedback

Mineral Tenements: [gsv.mineraltenements@ecodev.vic.gov.au](mailto:gsv.mineraltenements@ecodev.vic.gov.au)

The screenshot shows the 'EARTH RESOURCES' website. The navigation menu includes 'Licensing & approvals', 'Geology & exploration', 'Legislation & regulations' (highlighted), 'Community & land use', 'Projects', and 'About us'. The breadcrumb trail is: Home > Legislation & regulations > Compliance and enforcement > Reporting and expenditure > Exploration reporting guidelines. The main heading is 'Exploration reporting guidelines'. Below it, there is a sub-heading 'Download the complete reporting guide' with a link to a Word document. A 'Summary of reporting requirements' section is also visible, detailing the technical report of exploration – Annual and final (Regulation 57).

The screenshot shows the 'Earth Resources - GeoVic - Explore Victoria Online' interface. The 'Active Layer' is set to 'Current Mineral Exploration Licences'. The map displays various colored areas representing different types of mineral tenements and land ownership across Victoria. A legend on the left lists layers such as 'Active Layer Selections', 'Towns', 'Current Mining Licences and Leases', 'Current Retention Licences', 'Current Prospecting Licences', 'Current Extractive Industry Work Authorities', 'Current Mineral Exploration Licences', 'Structural Zones (boundaries)', 'Roads', 'Victoria Boundary', 'Unavailable Crown Land (MRSDA)', 'Geological Polygons 4M', 'Commonwealth Land', 'Unavailable S7 Exempt Areas (MRSDA)', and 'Restricted Crown Land (MRSDA)'. The map includes a scale bar (1:4,200,000) and a 'Quick Search' field.

# Minerals Program 2022



GEOLOGICAL SURVEY OF VICTORIA



GSV0160  
Date: 22/06/2022

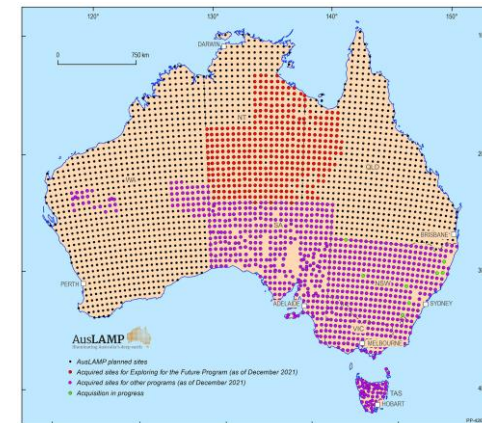
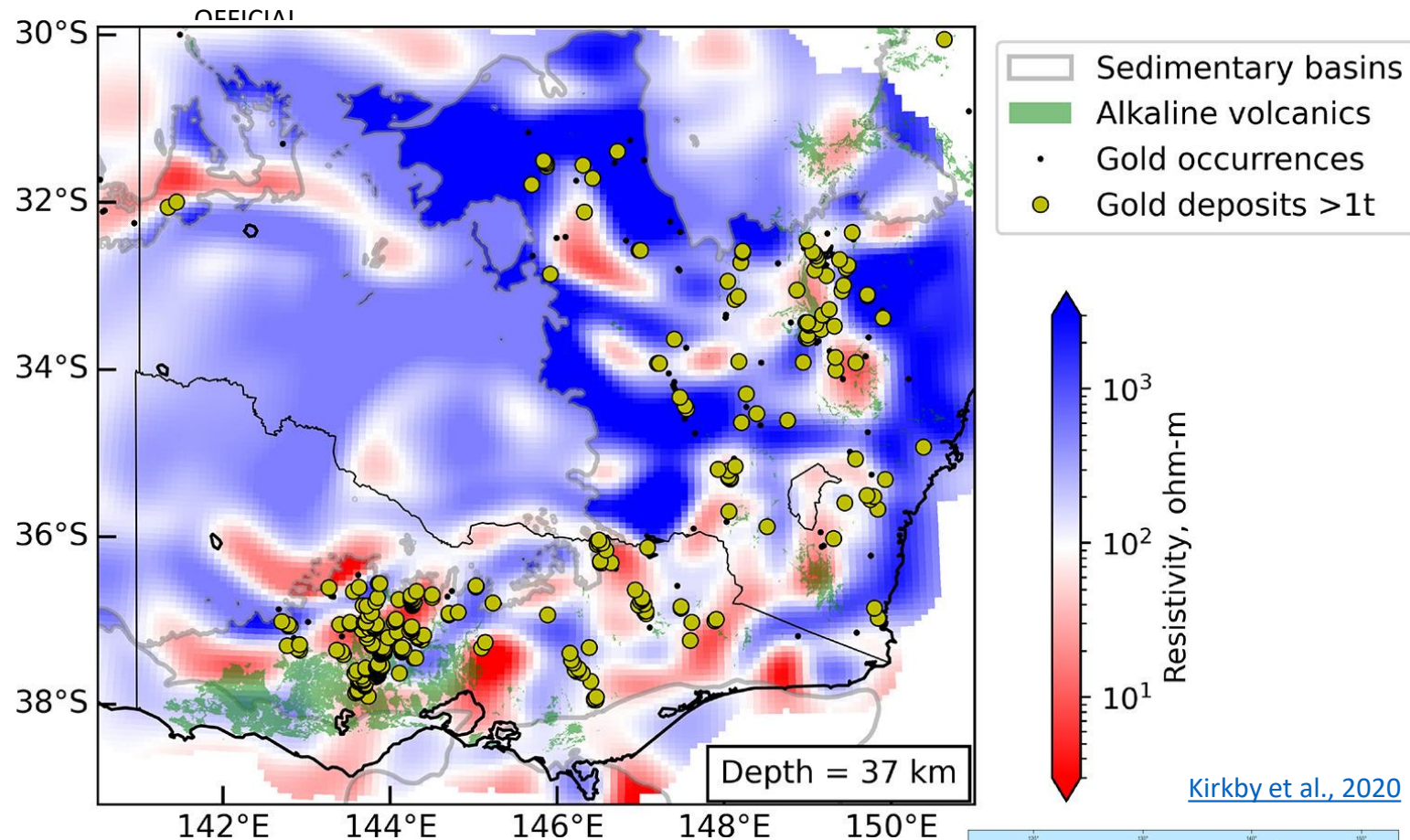


# Geological Survey of Victoria Geoscience Australia

National Collaborative Framework agreements

# AusLAMP

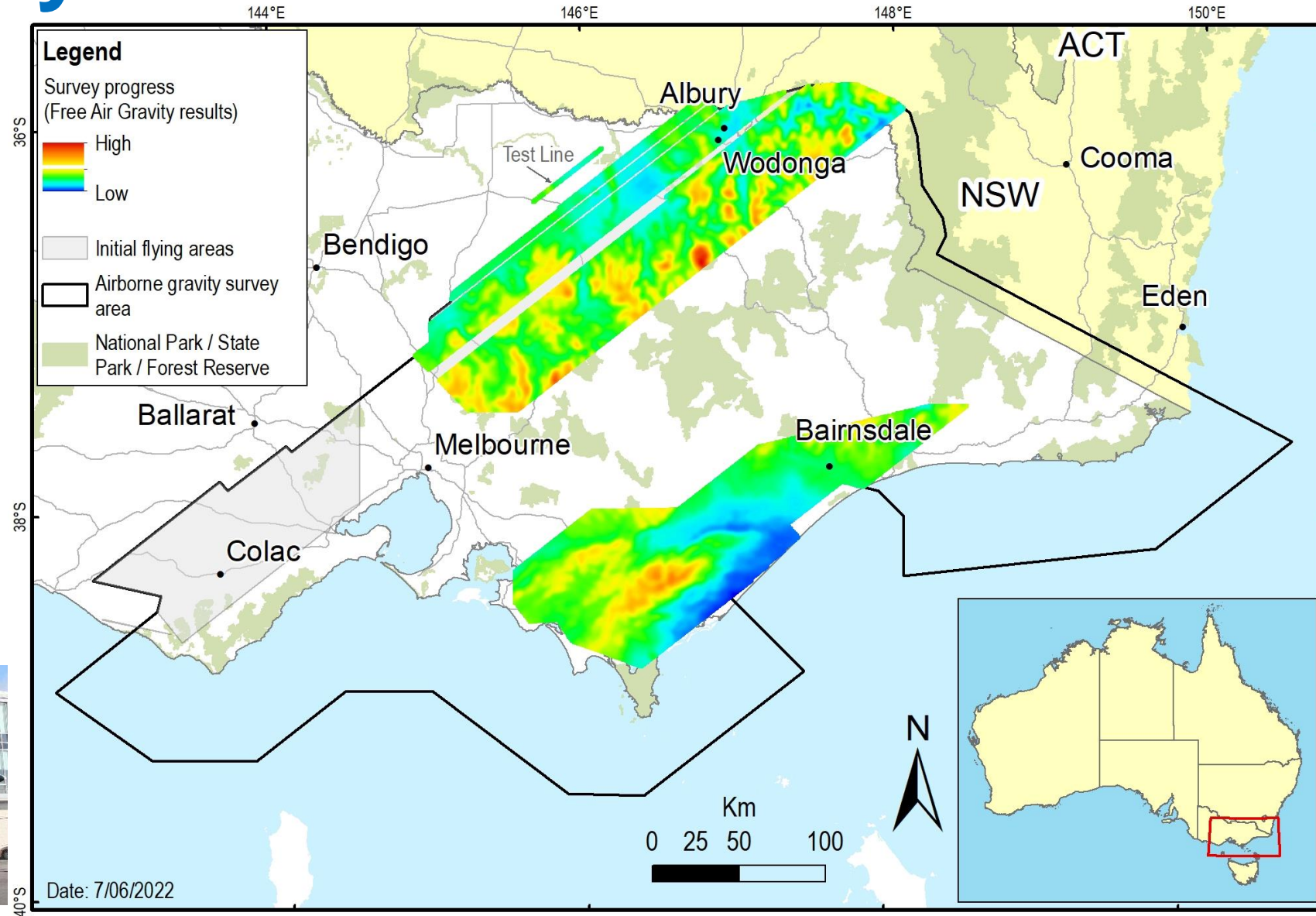
- [Australian Lithospheric Architecture Magnetotelluric Project](#)
- Collaborative, national survey between government and researchers
- Long-period data to map electrical conductivity structures in the crust and upper mantle to improve the understanding of the geology and tectonic evolution of the Australian plate.
- 55km stations (co-located AusARRAY)
- Victoria completed and [published](#)





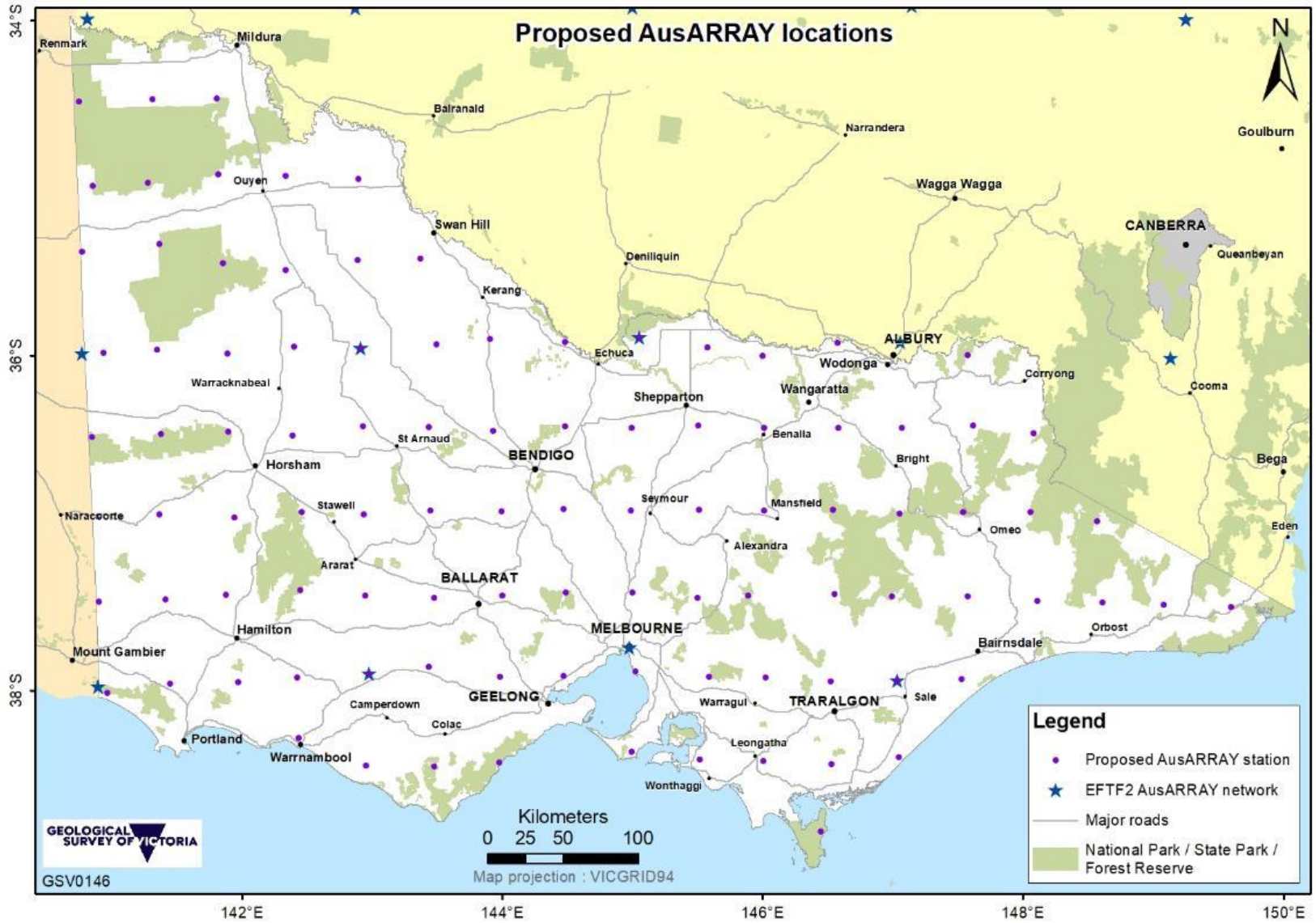
# Airborne gravity

- Improve mapping of Victoria's geological architecture and improve the vertical accuracy of GPS
- GSV, DELWP/Surveyor General of Victoria & Geoscience Australia
- More [information](#)



# AusArray

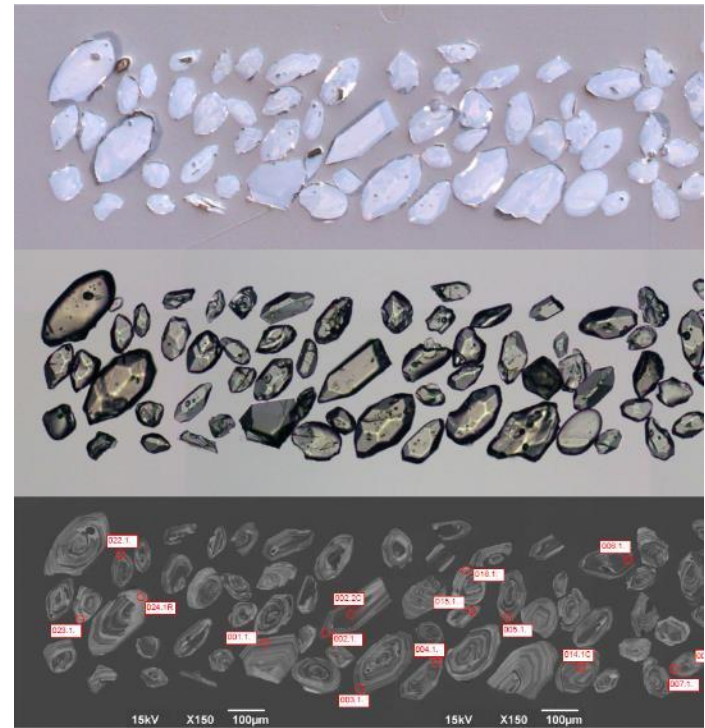
- [Australian Passive Seismic Array](#)
- Collaborative, national survey between government and researchers
- Seismic velocity data to map the Australian lithosphere
- 55km stations co-located with AusLAMP
  - First pass 200km stations (EFTF)



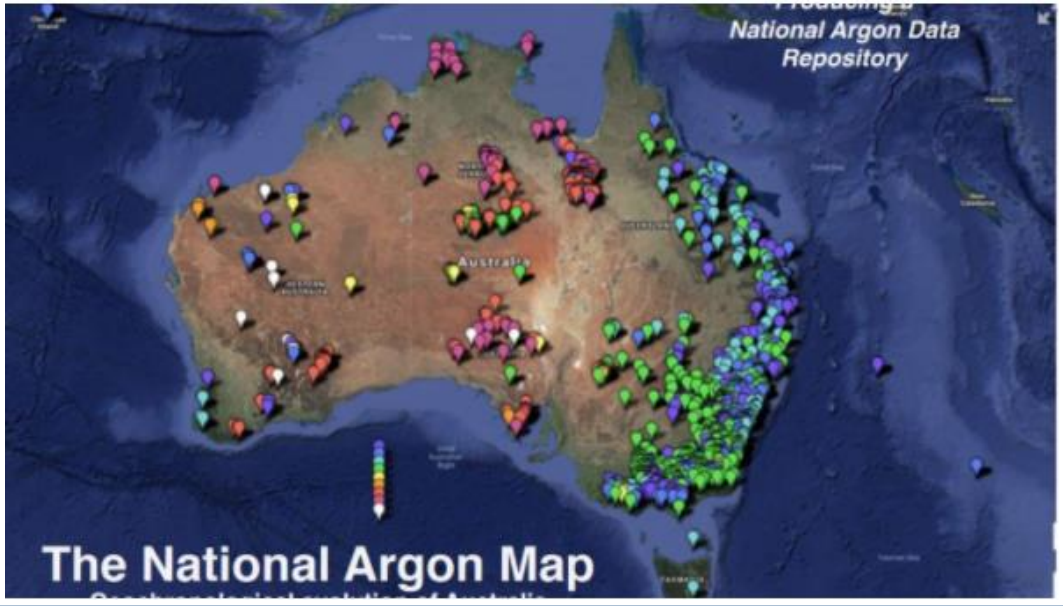


# Geochronology

- 3 year collaboration: [Geoscience Australia](#)
  - ~60 samples – mostly U-Pb zircon
  - Geological architecture/mineralisation
- New publication: 890 results available through [national portal](#)
- [National Argon Map](#)
  - Geoscience Australia, AuScope
  - Geological architecture/mineralisation



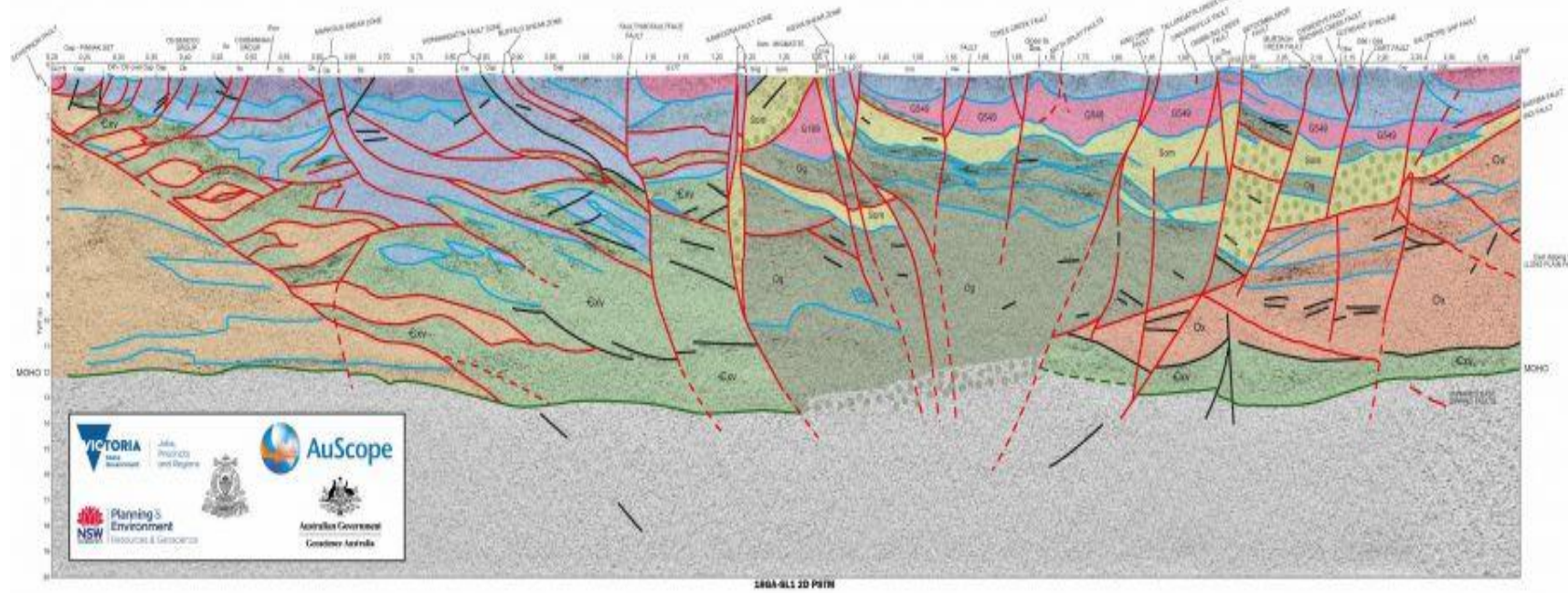
Stavely Project – Victor Porphyry, zircon grains for U-Pb analysis (Geoscience Australia)





# Southeast Lachlan Crustal Transect

- Geological interpretation of the Southeast Lachlan Crustal Transect (interpretation) report
- Ground gravity field operations report
- Magnetotellurics postponed (COVID)
- Film: [Beneath the Australian Alps](#)

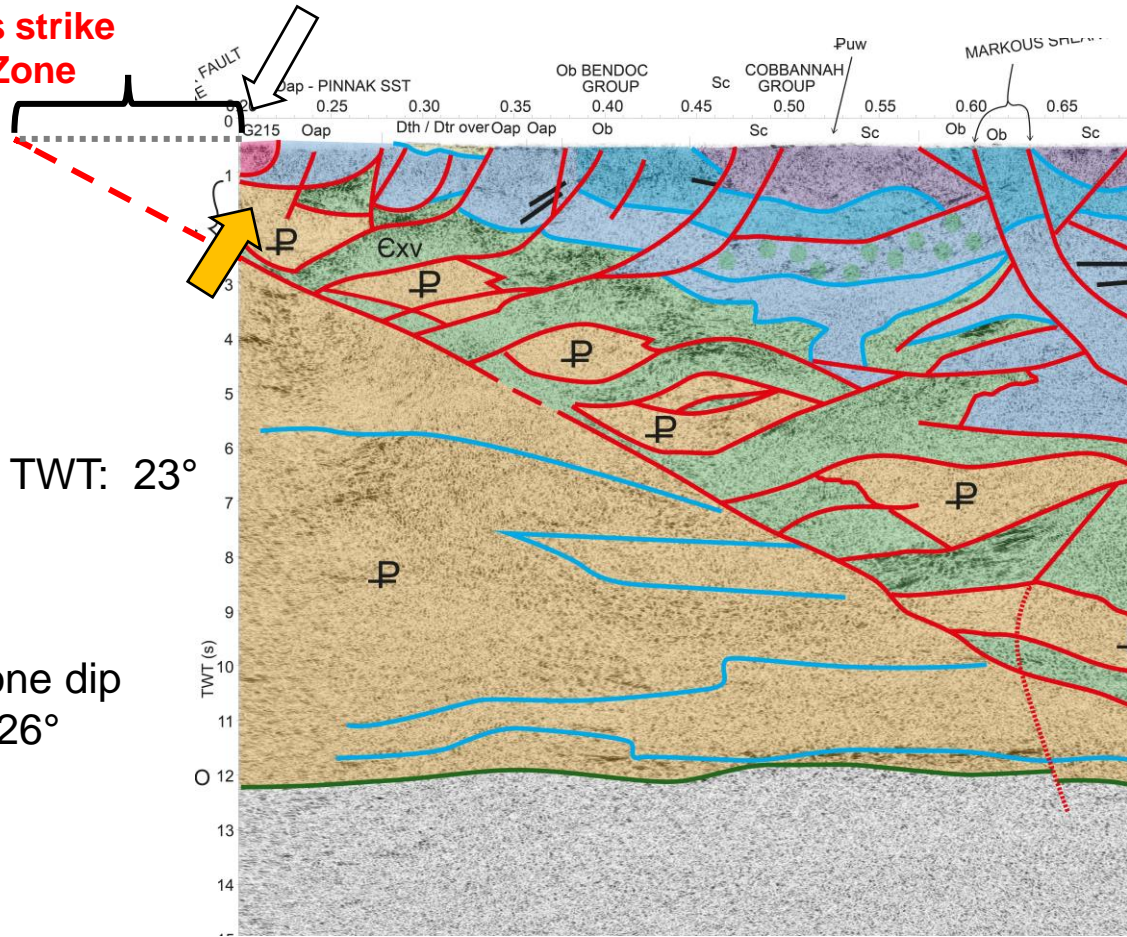




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Governor Fault Zone footwall projects to a position 12 to 15 km across strike within Melbourne Zone

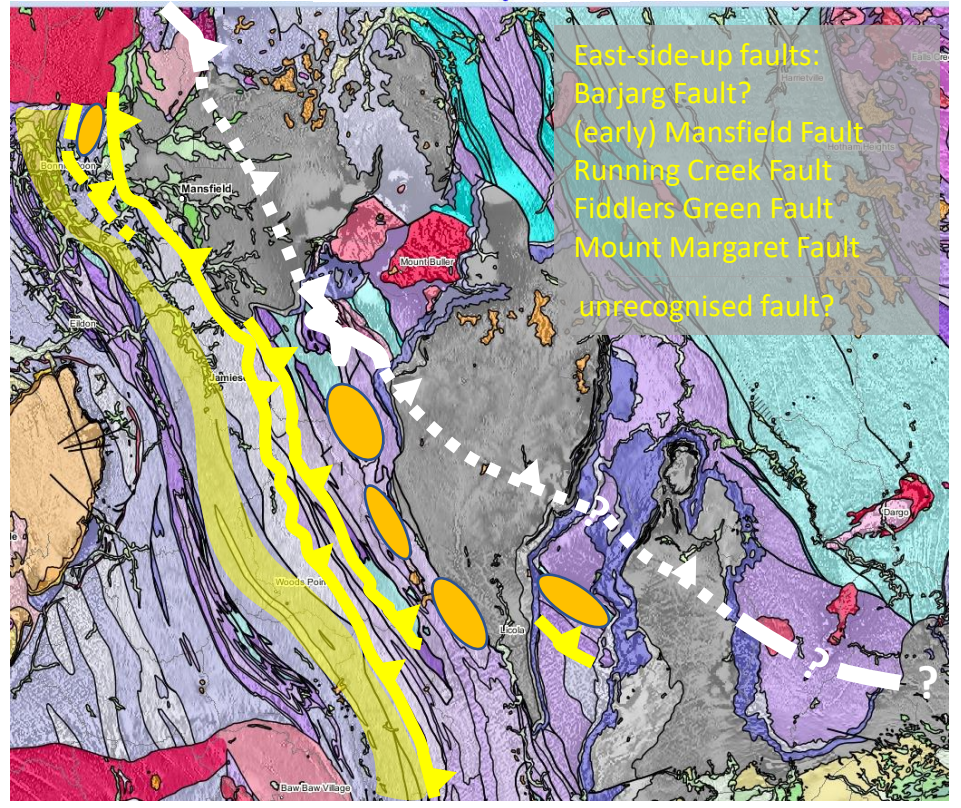
Mapped Governor Fault position at surface



Average FZ dip from ~ 4 to 2.5 s TWT: 23°

Average Fault Zone dip to base of crust: 26°

Gov Fault



East-side-up faults: Barjarg Fault? (early) Mansfield Fault Running Creek Fault Fiddlers Green Fault Mount Margaret Fault unrecognised fault?

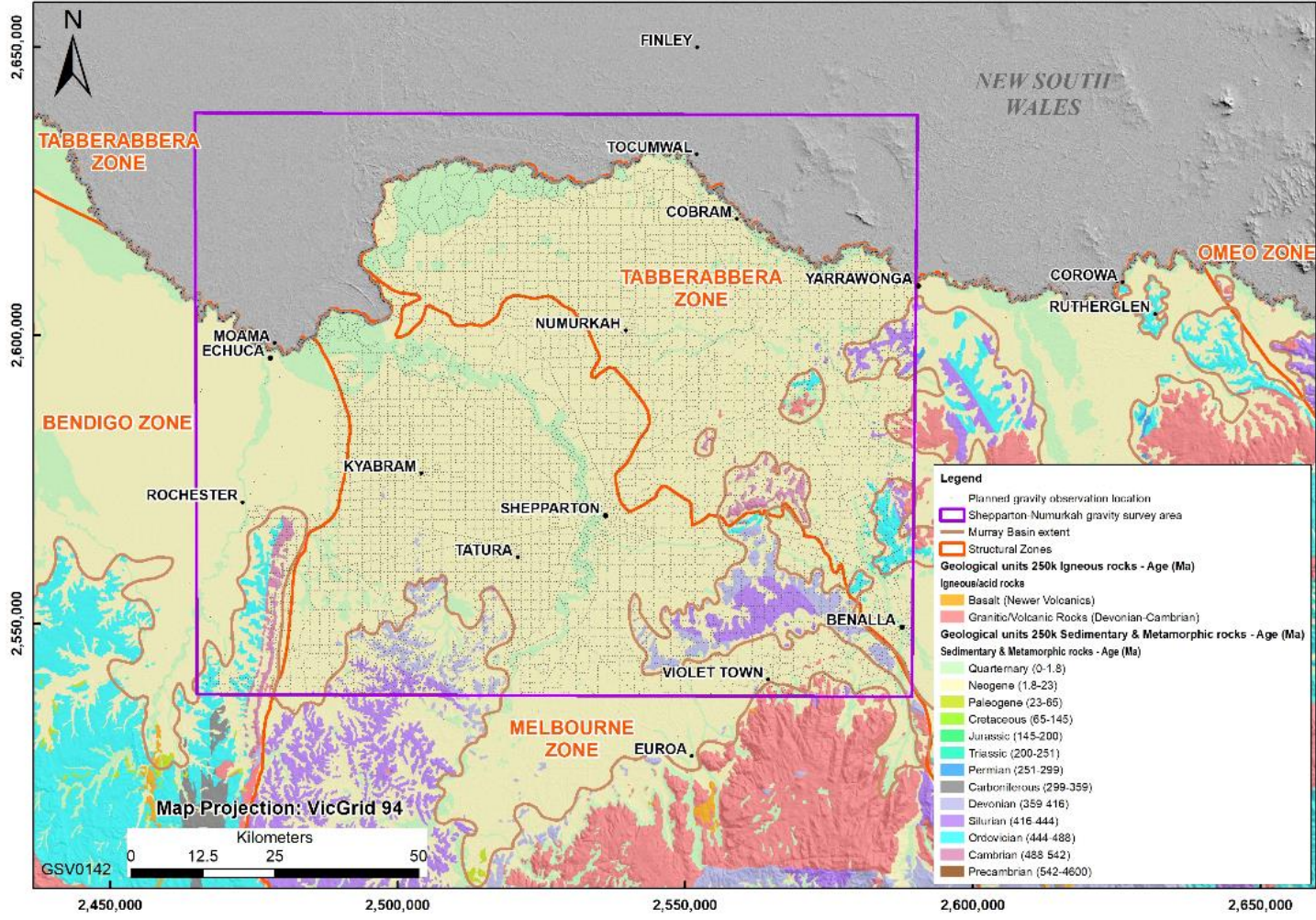
- SLaCT seismic reflection data reveals the Governor Fault Zone as a 1.5 – 2 s TWT thick (= ~4.5 - 6 km) mega-thrust.
- the complex upper part of the fault zone is exposed as the Governor Fault; the planar lower part is exposed as the Fiddlers Green Fault (and related structures) – the GSV (in prep) interprets the Fiddlers Green Fault as the potential primary control on the distribution of the Woods Point Dyke Swarm (during transtensional reactivation) and, subsequently, the Woods Point-Walhalla Goldfield (during transpressional reactivation).

Potential for Woods Point Walhalla analogue to the north Strathbogie Granite?



# Northeast Victoria ground gravity

- Semi-regional infill
  - northern Melbourne and Tabberabbera zones
  - Extend Mitiamo survey (2007)
    - north Bendigo Zone
    - gold discoveries under cover



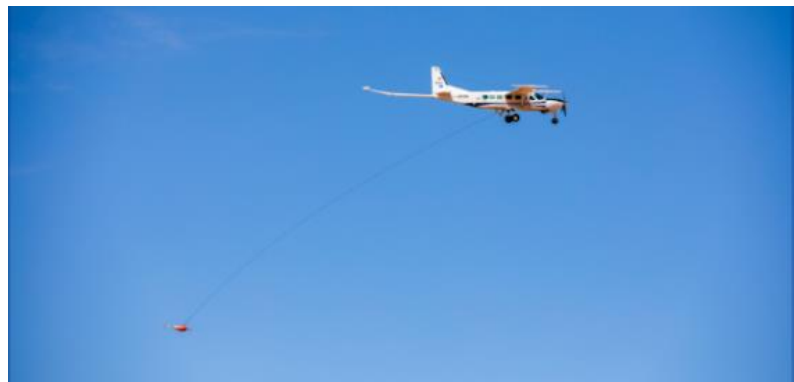
# Geoscience Australia Geological Survey of Victoria

Exploring for the Future (2020-2024)



# AusAEM

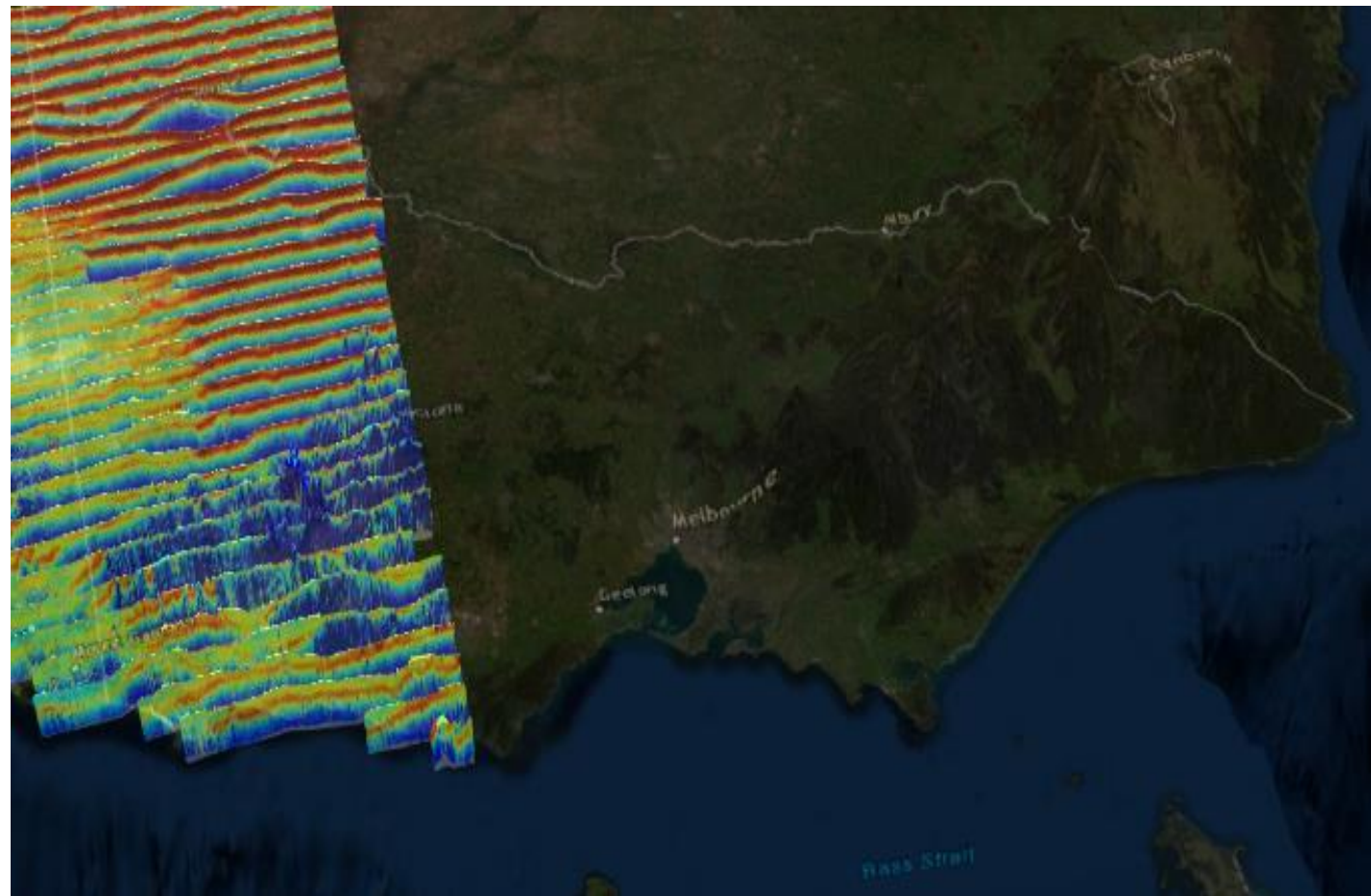
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- [National airborne electromagnetic survey](#)
- Data available – Exploring for the Future portal
- Upcoming infill



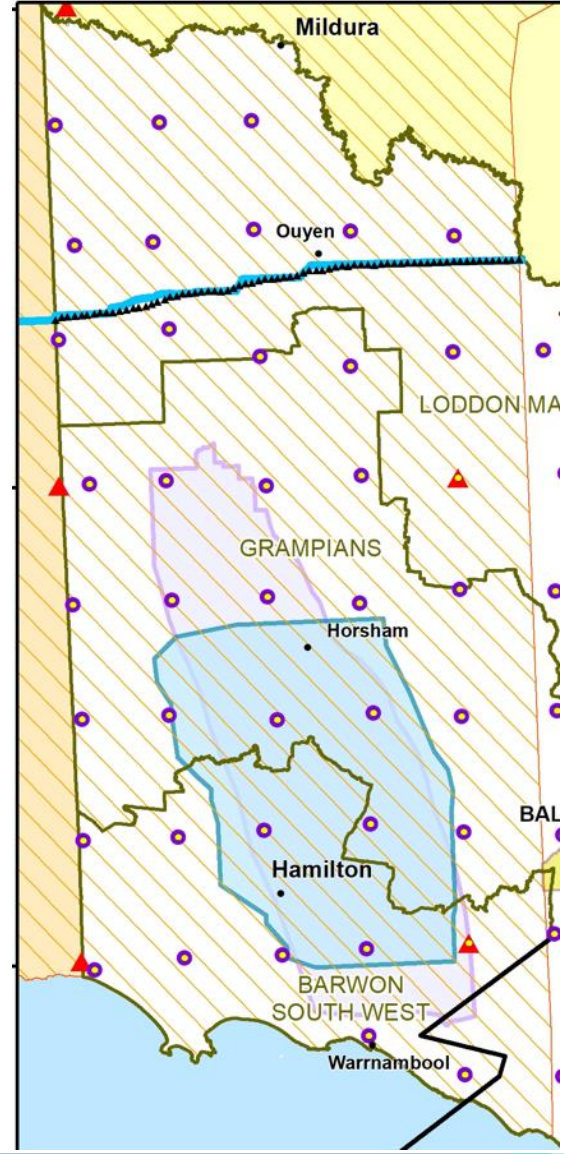
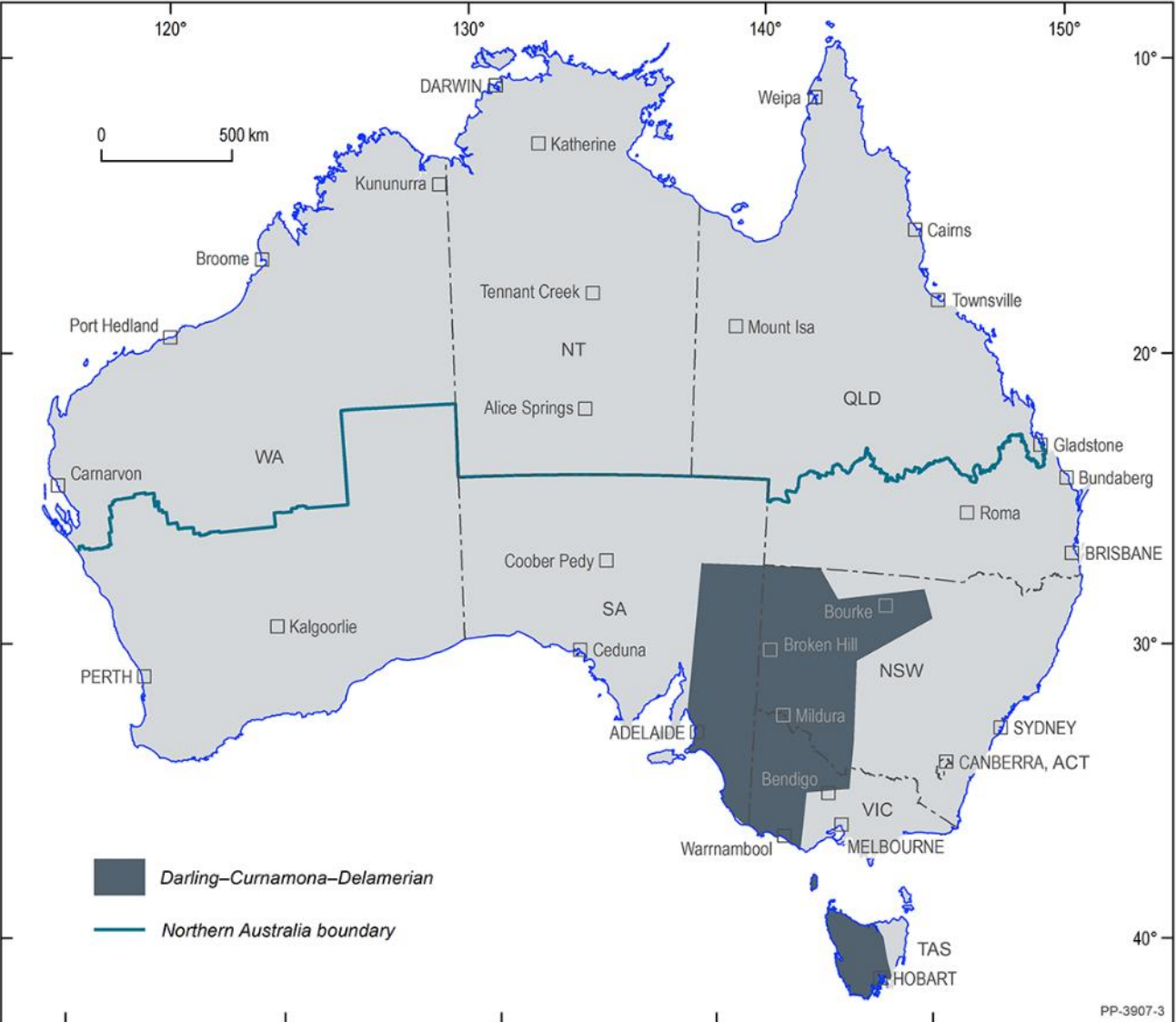
- River
- Road
- ▭ AEM Survey Area
- ▣ Town/location



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# Darling-Curnamona-Delamerian

- Delamerian deep 2D (crustal-scale) seismic reflection survey
  - northwest Victoria
  - GA-GSSA-GSNSW-GSV
  - Ground gravity
- AEM (5km) infill
  - Stavely Project area and surrounds
- Broadband magnetotelluric survey (GSV-GSSA)



# Critical Minerals Geological Survey of Victoria

2022-2024



# Critical Minerals - Current Understanding

- Two years of focussed projects
  - Collaborative opportunities with other researchers and industry

Victoria's share of Australia's mineral sands



Ilmenite

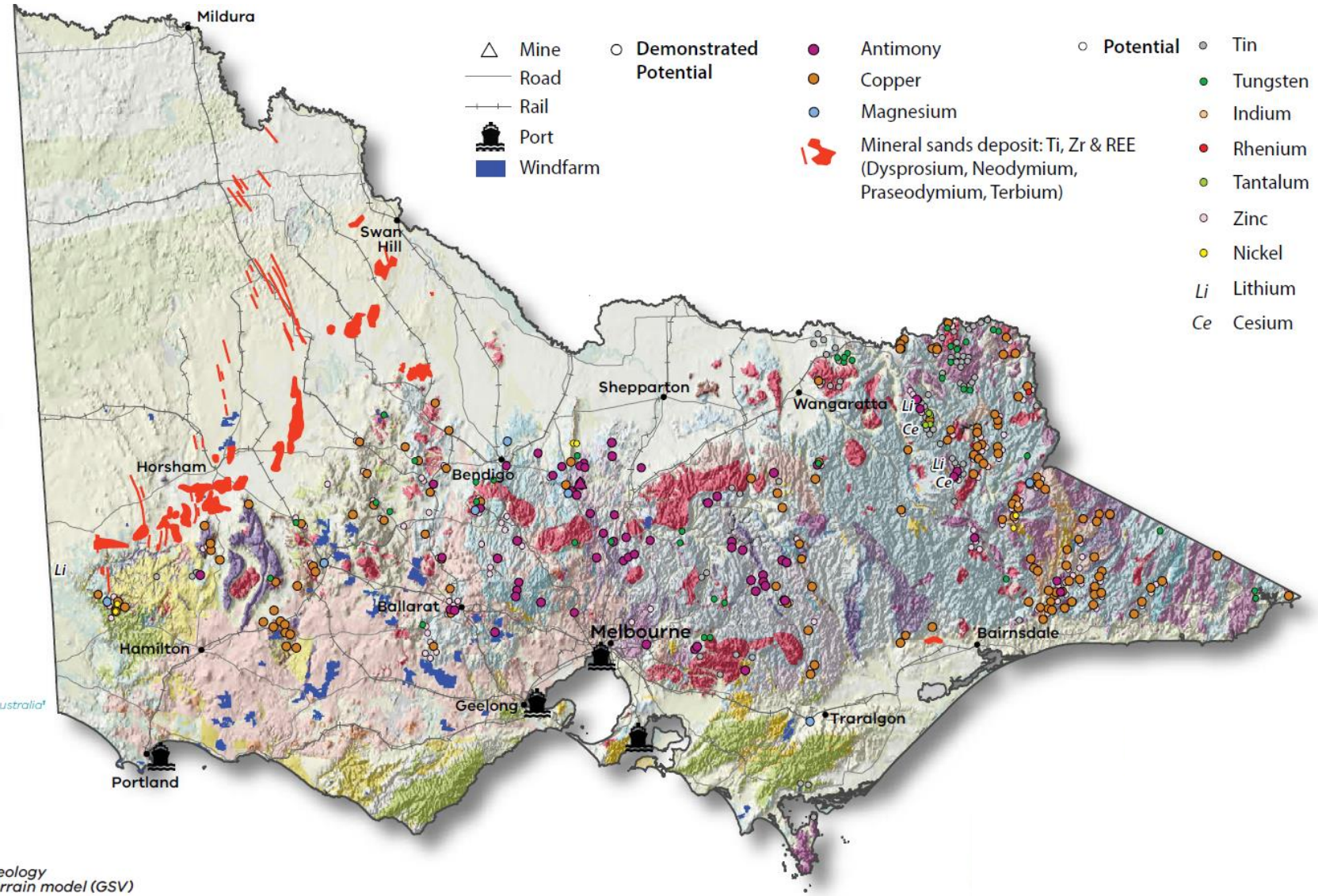


Rutile



Zircon

Source: Geoscience Australia & Minerals Council of Australia



Background image: 1: 1,000,000 seamless geology over greyscale digital terrain model (GSV)



# Mineral Resources – Critical Minerals

## Critical Energy Minerals Roadmap

### Characterisation

- [μ-XRF Maia Mapper](#) (Clayton)
- [Malyzer](#)
- [HyLogger3](#)
- XRD, other

### REE in mineral sands and clays

- Evaluate occurrences, resource characterisation and processing potential – integration of geophysics, mineralogy, geochemistry, geophysics and metallurgy

### Industry collaboration programs/funding

- [Innovations Connections](#)
- [CSIRO Kick-Start](#)



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Group Leader  
Dr [Susanne.Schmid@csiro.au](mailto:Susanne.Schmid@csiro.au)





# MinEx CRC Geological Survey of Victoria

2019-2029



- World's largest mineral exploration collaborative [project](#)
- Affiliate member
- National Drilling Initiative - at least one planned stratigraphic drilling program
- Orogenic gold
  - Data review and sampling commenced
  - 1 x PhD (resistate mineralogy) - underway
  - 1 x PhD (structural geophysics) – available
  - 1 x PhD (biogeochemistry) - available
  - Embedded research capability (CSIRO)
    - Phase 2 (2022-2024)
  - Align with associated work programs







# Discovery Program

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Science in partnership with the resources industry will drive innovation in mineral exploration

## Hydrogeochemistry

Open-access [national groundwater explorer](#): BoM, CSIRO, GA

## Electromagnetics and Seismic

Mineral and water resource delineation

## Magmatic Sulfides

Detection and characterisation of Ni-Cu-Co-PGEs

## Decision-support tools

### Hyperspectral analysis

Automated HyLogger-3 drill core hyperspectral mineralogy, [The Spectral Geologist](#)

### Ultrafine+

Soil particle analysis, gold and path finder elements (through Labwest)

### Data Mosaic

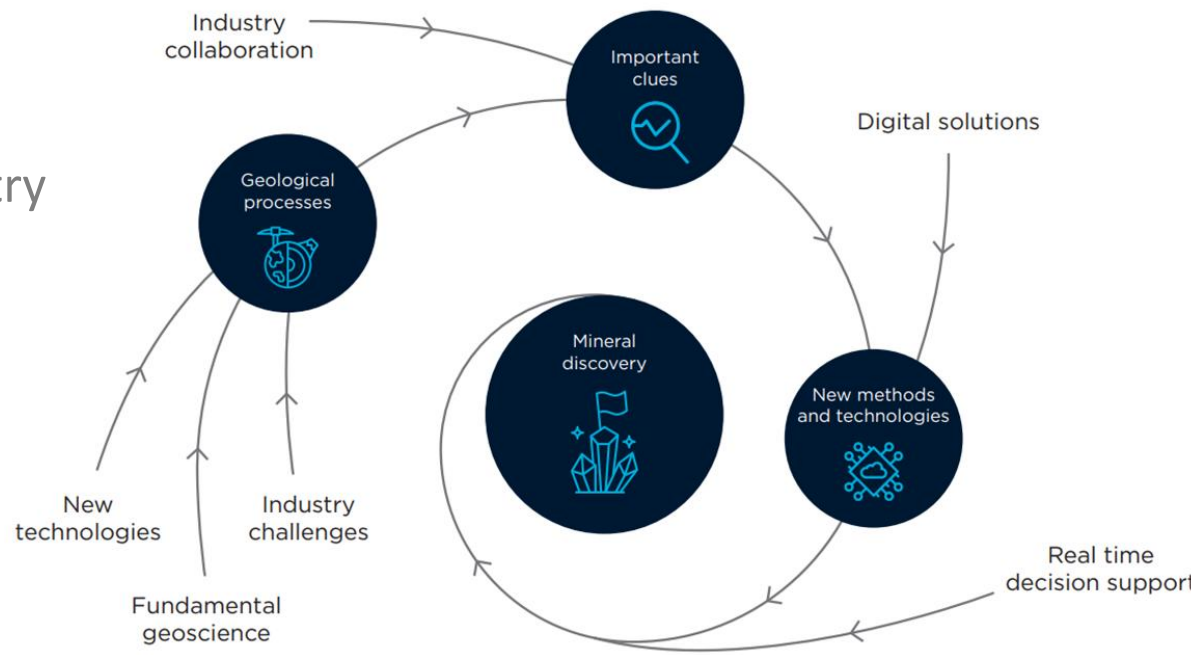
Rapid machine learning for consistent logging

## Mobile petrophysics laboratory

Integrated petrophysics, including mineralogy, geochemistry structure

## Sediment-Hosted Mineral Systems

Basin analysis with sediment-hosted mineral systems



## Industry collaboration programs/funding

- [Innovations Connections](#)
- [CSIRO Kick-Start](#)

## Further details



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Team Leader  
Dr [Helen.McFarlane@csiro.au](mailto:Helen.McFarlane@csiro.au)

# Extractives (Quarry Materials)

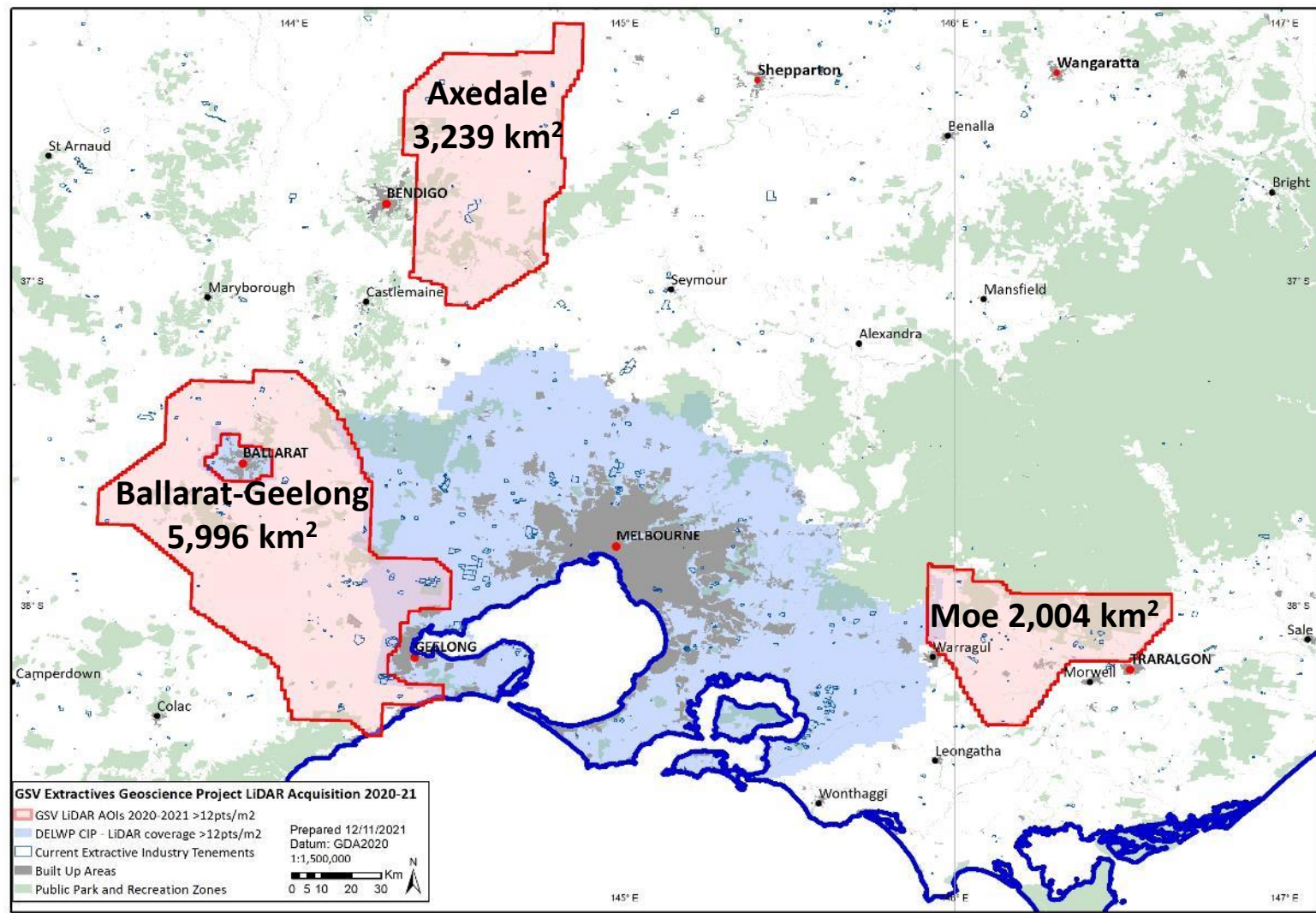
2020-2023



# Helping Victoria Grow: Extractive Resources Strategy

## Delivering Rock solid foundations: Extractives Geoscience Project

- Cutting edge tech, equaling highest resolutions and largest areas ever attempted (in Vic public sector) for geological applications
- Trial LiDAR as one tool to improve geological mapping: time and accuracy -> directly or indirectly detect extractives (quarrying) source rock distribution
- 3 x Areas of Interest surveyed: Moe, Axedale and Ballarat-Geelong. Aerial acquisition complete for all
- Areas selected due to geological features associated with extractive occurrences and to expand upon DELWP's very recent, equally high-resolution LiDAR surveys over Greater Melbourne
- **Data is freely available via Geoscience Australia's [ELVIS](#) platform**
- **[Digital Twin Victoria](#)** statewide LiDAR survey
  - [Coordinated Imagery Program](#) (DELWP)

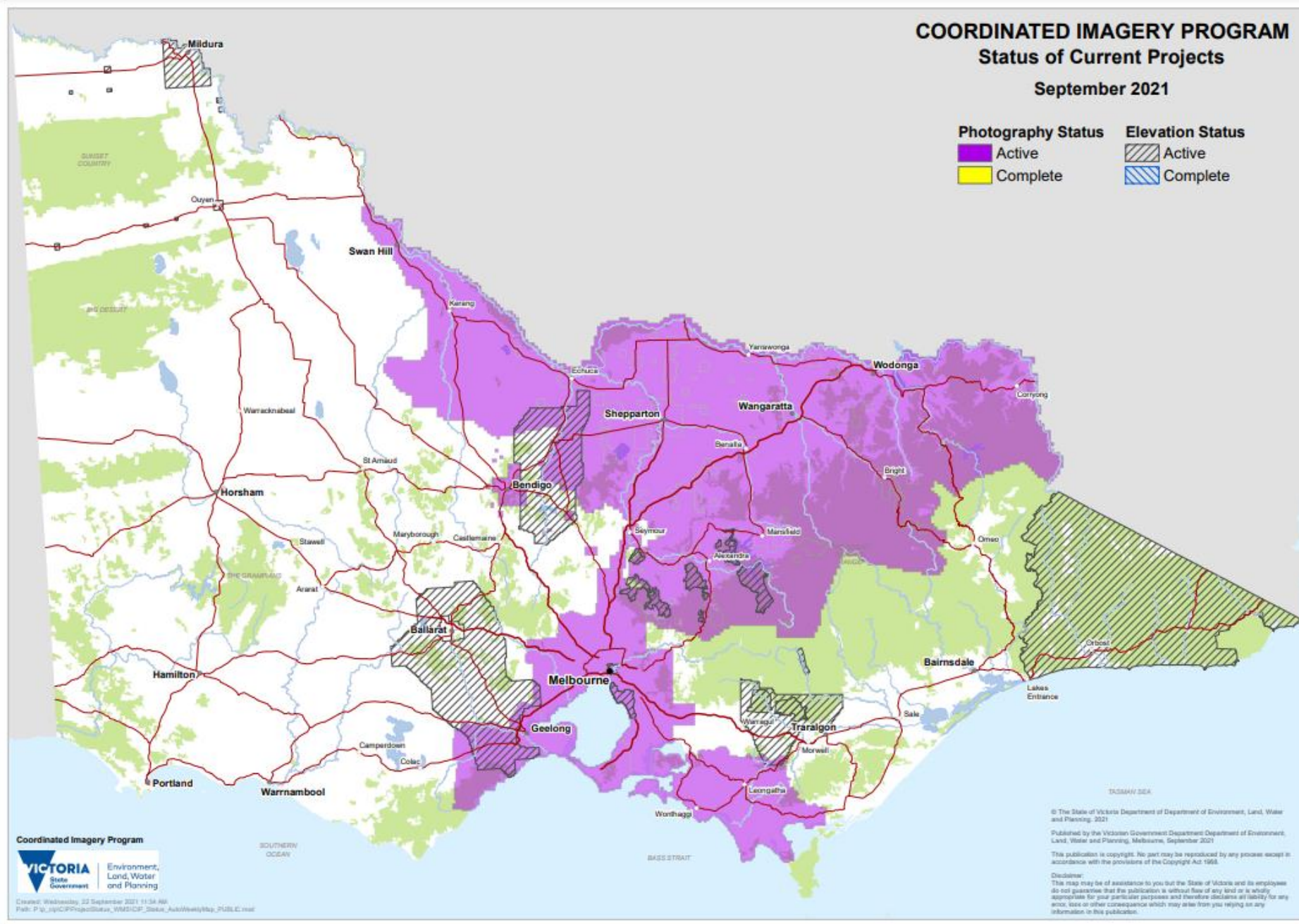


# COORDINATED IMAGERY PROGRAM

## Status of Current Projects

September 2021

Photography Status	Elevation Status
Active	Active
Complete	Complete



Coordinated Imagery Program



Created: Wednesday, 22 September 2021 11:34 AM  
Path: P:\\_ip\IP\Project\Status\_WMS\ICP\_Status\_AusWeeklyMap\_PUBLC.mxd

TASMAN SEA  
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# GSV's new team member

[Kate.Bassano@ecodev.vic.gov.au](mailto:Kate.Bassano@ecodev.vic.gov.au)

**Manager, Exploration and Development**

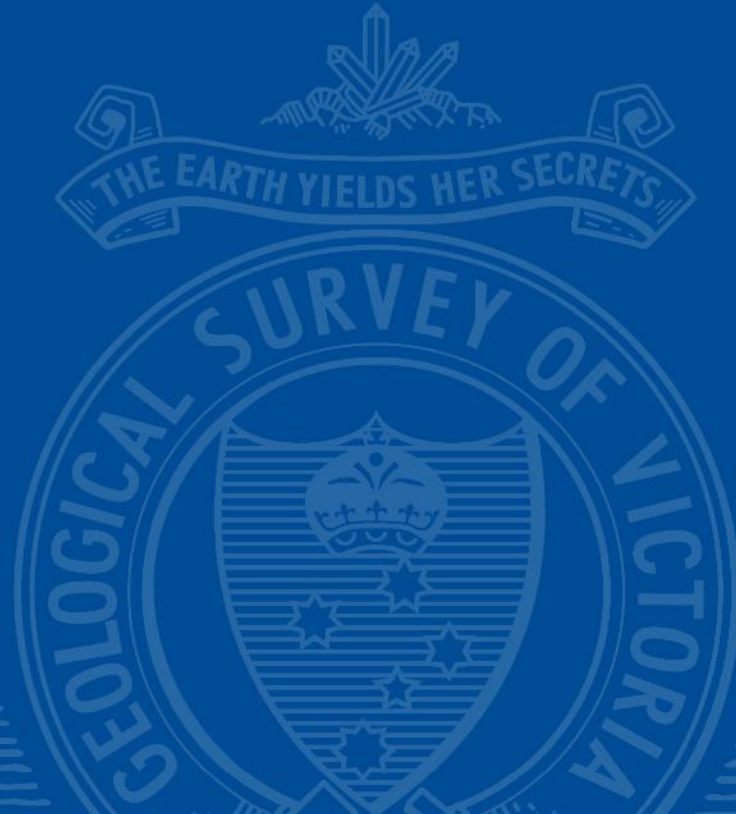
This leadership role will:

- build on Victoria's geoscience data and knowledge to find new ways to reach senior technical personnel and key decision makers and foster professional relationships
- promote Victoria's mineral provinces, energy basins and earth resource investment opportunities.

Kate will take the lead on:

- managing promotions and events,
- undertaking ground and acreage releases (as required)
- managing grants programs
- generating investment leads
- managing client relationships
- managing resource sector comms and sponsorships
- developing resource promotional strategies and materials
- communicating with the Vic Gov international offices, as needed





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Jobs,  
Precincts  
and Regions