

SMI BRC

WH Bryan Mining &
Geology Research Centre

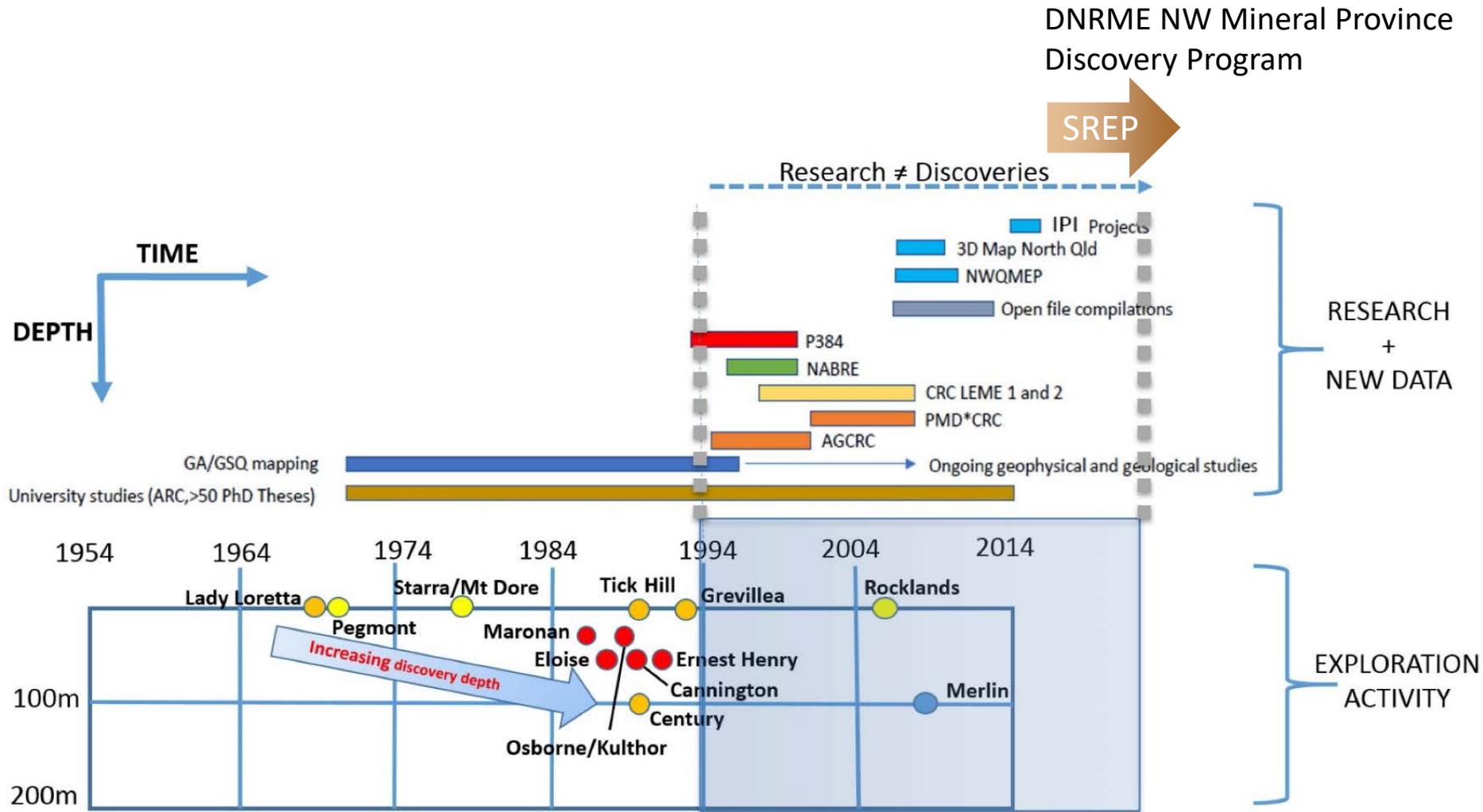
NW Mineral Province Discovery Program



Compilation Update

R Valenta – February 2018

Recent history – discoveries and studies



Current state

NWMP mines are maturing

- Short time frame to closures
- Declining economics of remaining

Lack of exploration success – need for a “step change”

- Multiple research projects and compilations over decades
- Strong base of data and knowledge
- Potential to improve industry focus of precompetitive products
- Untried approaches required

Decline in technical resources for exploration companies

- Declining exploration expenditure
- Decreasing resources for technical support

Increased role of junior companies

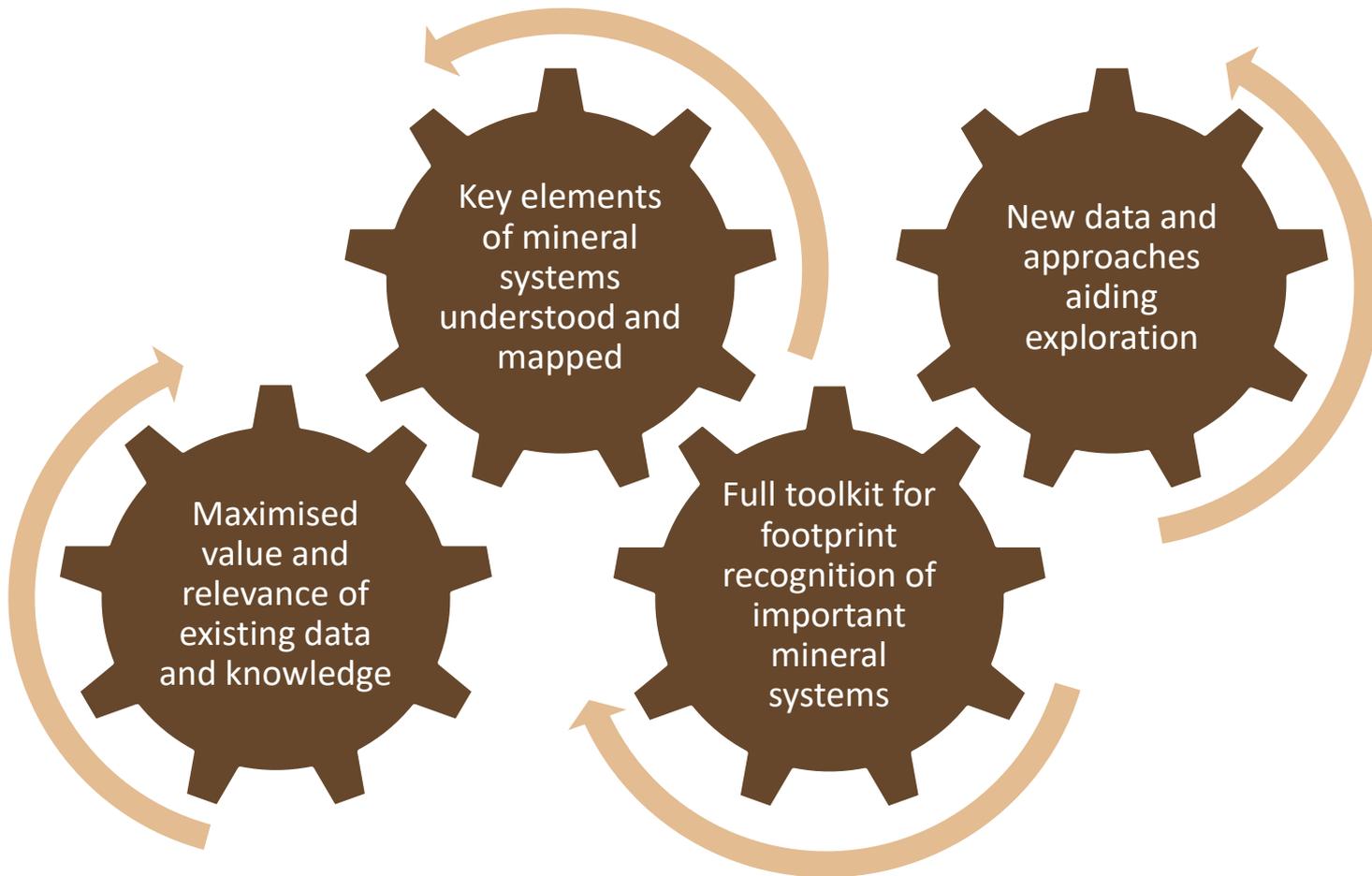
- Shorter time frames
- Need to reach drill stage quickly
- Need to maintain investor interest

New discoveries will not be easy

- Subtle
- Blind
- Buried under younger cover



Future state



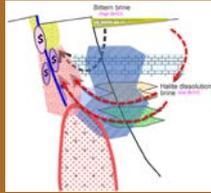
NWMP Discovery Program Components

Comprehensive compilation



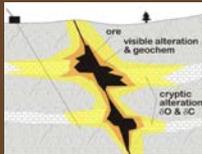
- updating the existing open file data compilations (to extent possible)
- distilling the results of geoscientific studies
- ensuring that this information is comprehensive, spatially consistent, well-explained
- delivered in a form which can be easily used by explorers and other projects

Mineral systems insight



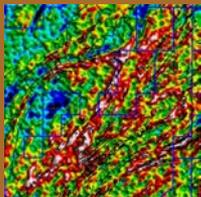
- Regional structural/stratigraphic targeting frameworks
- Mineral systems and footprints
- Studies of Igneous fertility
- New insights from data analytics

Exploration toolkits



- Atlas of Northwest Mineral Province mineral deposits
- Geochemistry over post-mineralisation cover sequences
- Halo models for recognition of blind or covered systems

Transformative new data and interpretations

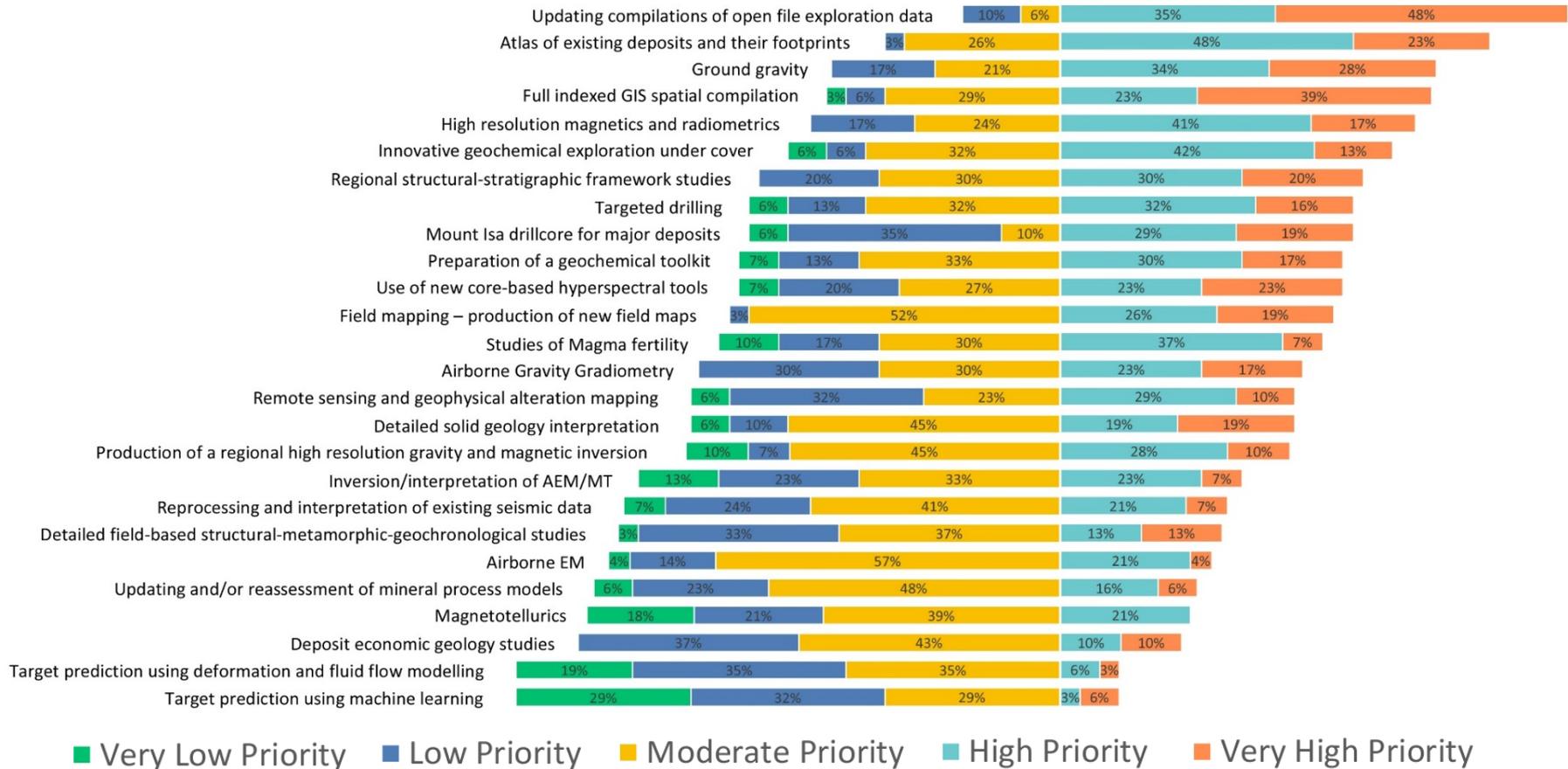


- New regional airborne gravity gradiometry
- Cover geochemical surveys
- Targeted drilling
- New interpretations of existing precompetitive datasets

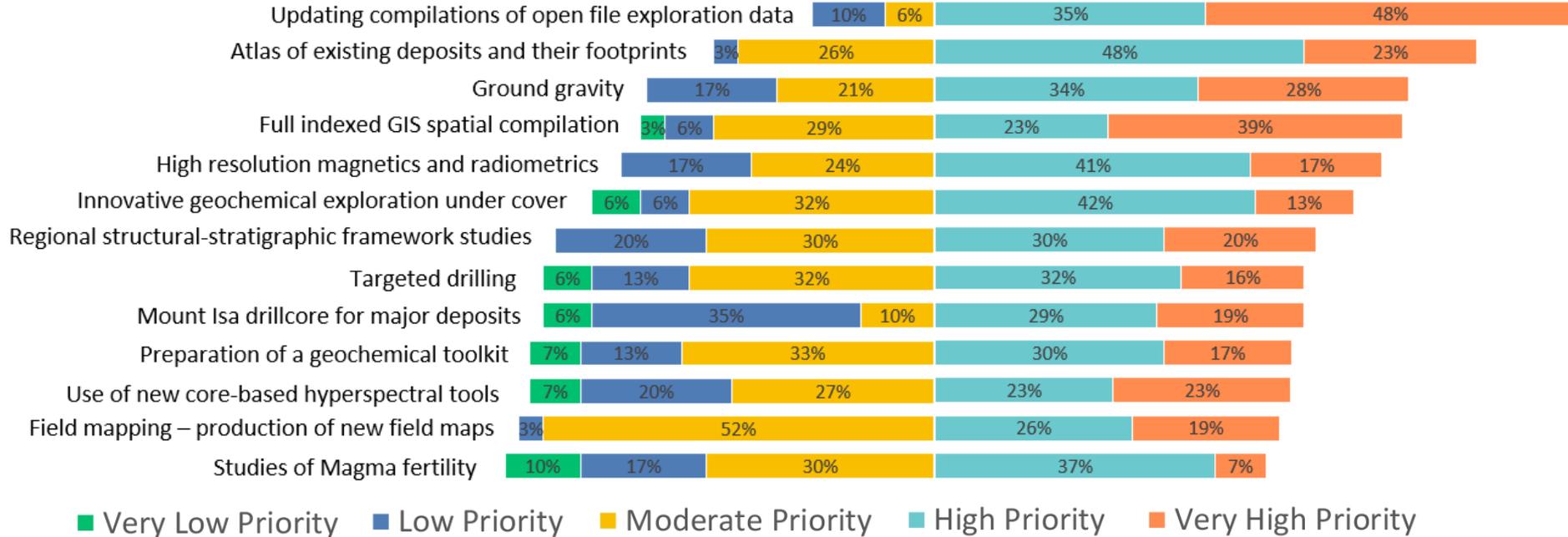


Survey of Industry - results

- Responses from a range of major and junior companies
- Roles covering range from MD/CEO to Project Geologist



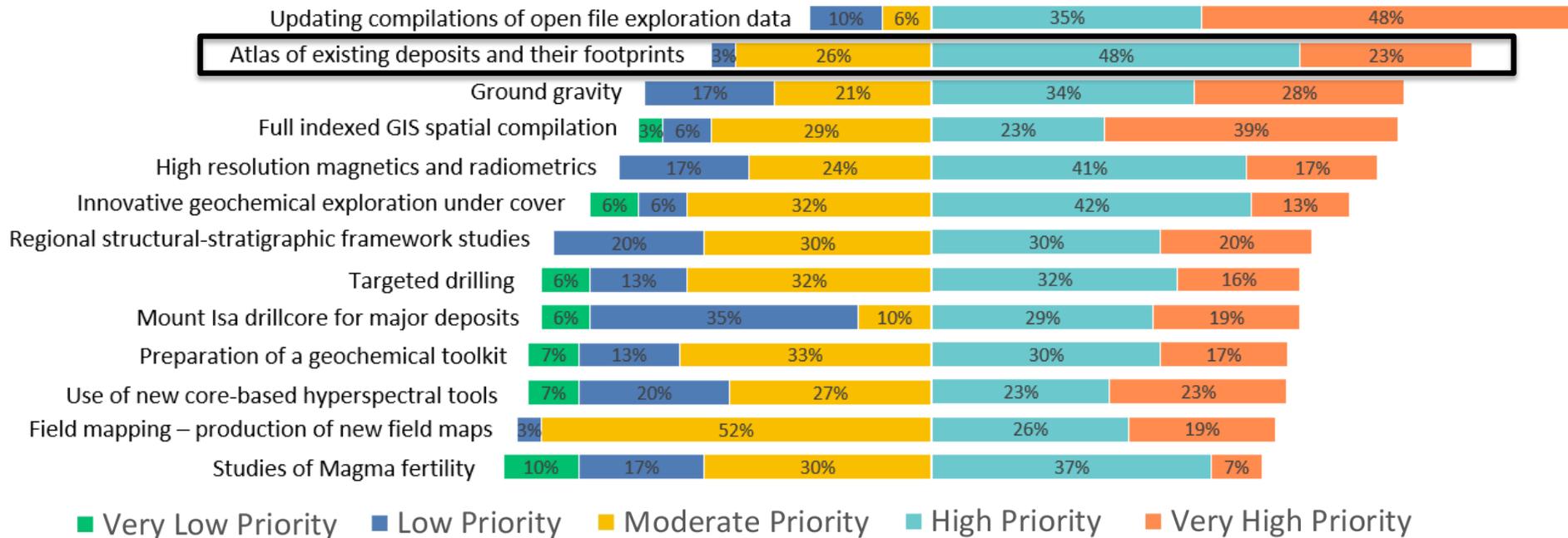
Survey of Industry – top half priorities



- Open file exploration data (1/26)
- Atlas of existing deposits and footprints (2/26)
- Full indexed GIS spatial compilation (4/26)
- Mount Isa drillcore repository (9/26)



Atlas of existing deposits and footprints



Atlas of existing deposits and footprints



THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

SMIBRC
WH Bryan Mining & Geology Research Centre

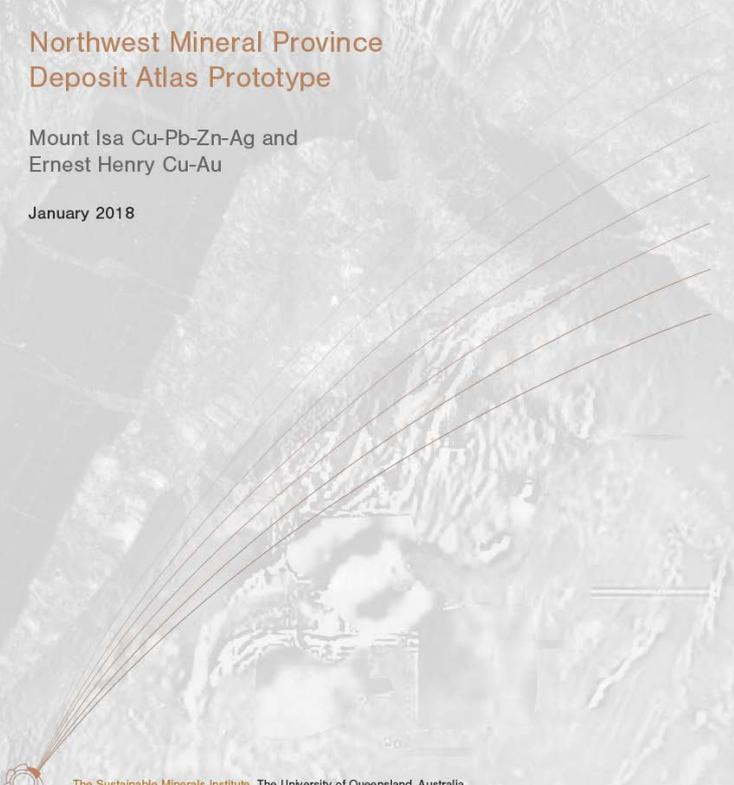


Queensland Government

Northwest Mineral Province Deposit Atlas Prototype

Mount Isa Cu-Pb-Zn-Ag and Ernest Henry Cu-Au

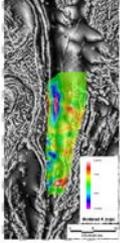
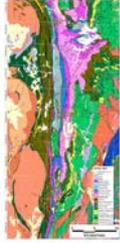
January 2018





The Sustainable Minerals Institute

The University of Queensland, Australia
P +61 7 3346 40003 F +61 7 3346 4045 E enquiries@smi.uq.edu.au www.smi.uq.edu.au

Chapter 2 Mount Isa	Chapter 2 Mount Isa
 <p>Figure 2.9: Anomalous image from Mount Isa with 40 processing applied (Cohen and Davis 1991). The effect of processing on the region is to highlight the sublinear distribution of traces of Eastern Creek Volcanics. Map Projection: UTM38MGS14.</p>  <p>Figure 2.10: Geospatial 3D algorithm magnified, with central portion of magnetic susceptibility of the Eastern Creek Volcanics are modified by a factor of 1000, showing the near magnetic susceptibility in the Eastern Creek Volcanics extending the Mount Isa core, interpreted to be related to mineralization-related tectonostructural evolution. Horizontal at 1000 m and a base of magnetic in the shaded (0-100) m of the Eastern Creek Volcanics under the upper and lower and the 1000 m.</p>	 <p>Figure 2.11: Anomalous image from Mount Isa with 40 processing applied (Cohen and Davis 1991). The effect of processing on the region is to highlight the sublinear distribution of traces of Eastern Creek Volcanics. Map Projection: UTM38MGS14.</p>  <p>Figure 2.12: Map derived from the Sea District 1:50,000 scale general geological at 100% shown for reference for Figure 2.9. Map Projection: UTM38MGS14.</p>
10 Northwest Mineral Province Deposit Atlas Prototype	11 Northwest Mineral Province Deposit Atlas Prototype

Basic geology and geophysics



Atlas of existing deposits and footprints



THE UNIVERSITY OF QUEENSLAND
AUSTRALIA



SMIBRC
WH Bryan Mining & Geology Research Centre

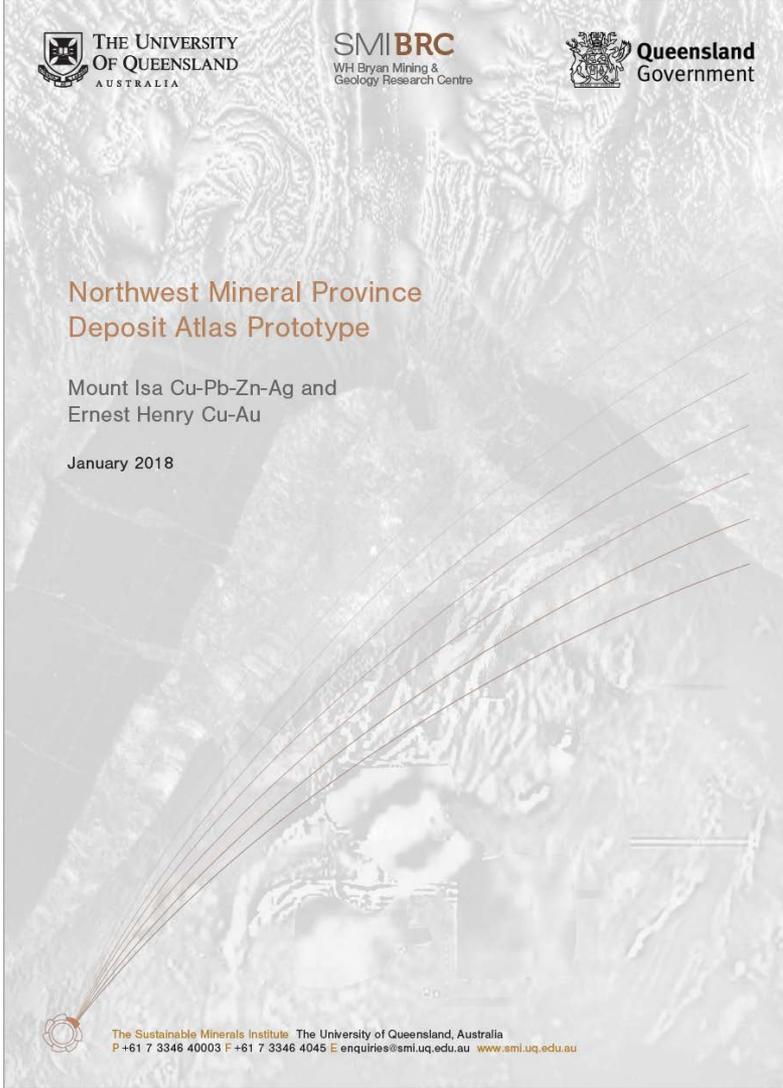


Queensland Government

Northwest Mineral Province Deposit Atlas Prototype

Mount Isa Cu-Pb-Zn-Ag and Ernest Henry Cu-Au

January 2018





The Sustainable Minerals Institute The University of Queensland, Australia
P +61 7 3346 40003 F +61 7 3346 4045 E enquiries@smi.uq.edu.au www.smi.uq.edu.au



Basic orebody geometry



Atlas of existing deposits and footprints



THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

SMIBRC
WH Bryan Mining & Geology Research Centre

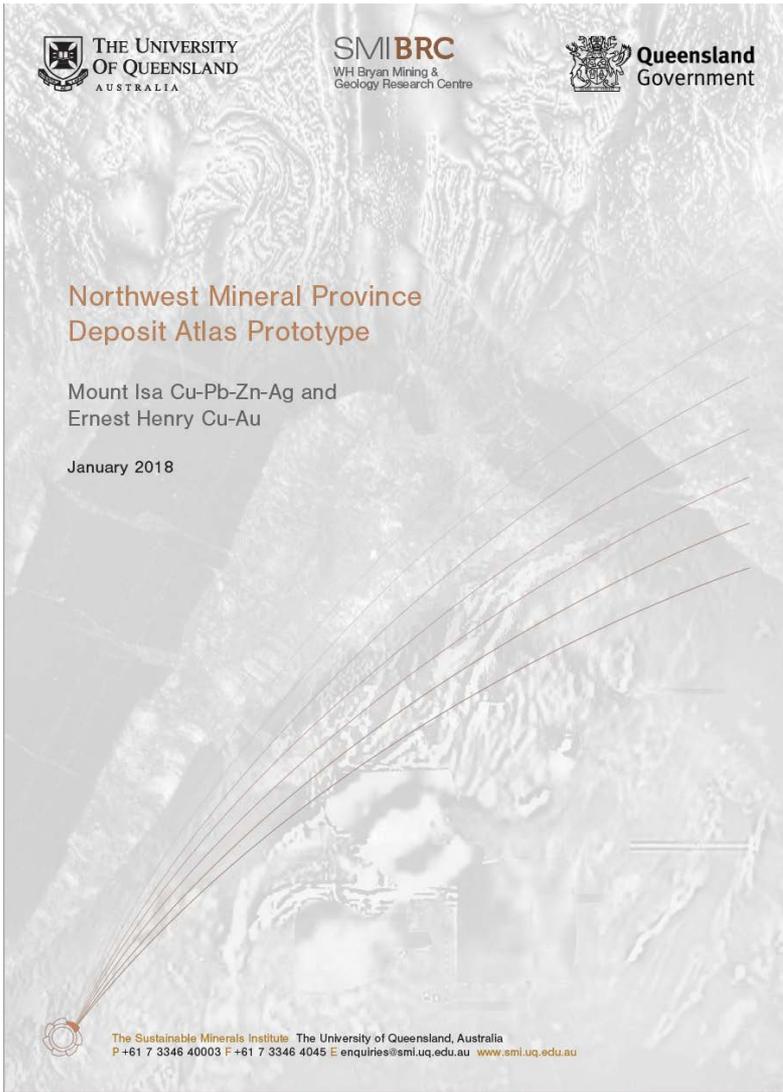


Queensland Government

Northwest Mineral Province Deposit Atlas Prototype

Mount Isa Cu-Pb-Zn-Ag and Ernest Henry Cu-Au

January 2018





The Sustainable Minerals Institute The University of Queensland, Australia
P +61 7 3346 40003 F +61 7 3346 4045 E enquiries@smi.uq.edu.au www.smi.uq.edu.au

Chapter 2 Mount Isa Mount Isa Chapter 2

Figure 2.19 Aerial photograph of the Mt Isa area with all processing related infrastructure and the Mt Isa mine site highlighted in red. The region is highlighted in yellow to indicate the location of the Mt Isa mine site.

Figure 2.20 Aerial photograph of the Mt Isa area with all processing related infrastructure and the Mt Isa mine site highlighted in red. The region is highlighted in yellow to indicate the location of the Mt Isa mine site.

Figure 2.21 Aerial photograph of the Mt Isa area with all processing related infrastructure and the Mt Isa mine site highlighted in red. The region is highlighted in yellow to indicate the location of the Mt Isa mine site.

Figure 2.22 Aerial photograph of the Mt Isa area with all processing related infrastructure and the Mt Isa mine site highlighted in red. The region is highlighted in yellow to indicate the location of the Mt Isa mine site.

Figure 2.23 Mineral zoning diagrams for the Mount Isa and Ernest Henry regions based on Geochem. See also zoning diagrams for the Mount Isa and Ernest Henry regions. The diagrams are presented and broadly stratigraphic, but with a strong emphasis on the relationship between the position of the Mount Isa and Ernest Henry regions.

Mineralogical and chemical summary zoning from Pairier (2003) PhD Thesis - Figure 2.27

Figure 2.27 Mineralogical and chemical summary zoning from Pairier (2003) PhD Thesis - Figure 2.27

Chapter 3 Ernest Henry Ernest Henry Chapter 3

Figure 3.1 Aerial photograph of the Ernest Henry region showing the Ernest Henry mine site and the surrounding area. The region is highlighted in yellow to indicate the location of the Ernest Henry mine site.

Figure 3.2 Composite aeromagnetic image showing the Ernest Henry region. The image is color-coded to show magnetic intensity variations. The Ernest Henry mine site is highlighted in red.

Figure 3.3 Composite aeromagnetic image showing the Ernest Henry region. The image is color-coded to show magnetic intensity variations. The Ernest Henry mine site is highlighted in red.

Figure 3.4 Composite aeromagnetic image showing the Ernest Henry region. The image is color-coded to show magnetic intensity variations. The Ernest Henry mine site is highlighted in red.

Updated solid geology



Atlas of existing deposits and footprints



THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

SMIBRC
WH Bryan Mining & Geology Research Centre

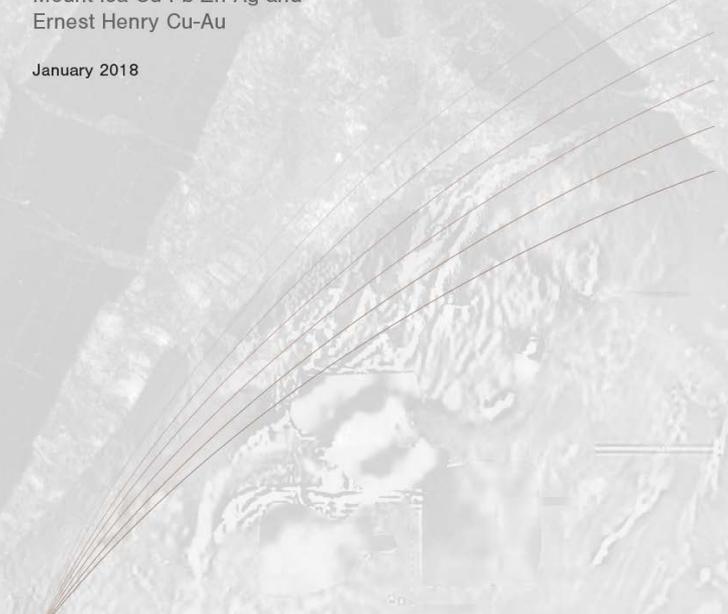


Queensland Government

Northwest Mineral Province Deposit Atlas Prototype

Mount Isa Cu-Pb-Zn-Ag and Ernest Henry Cu-Au

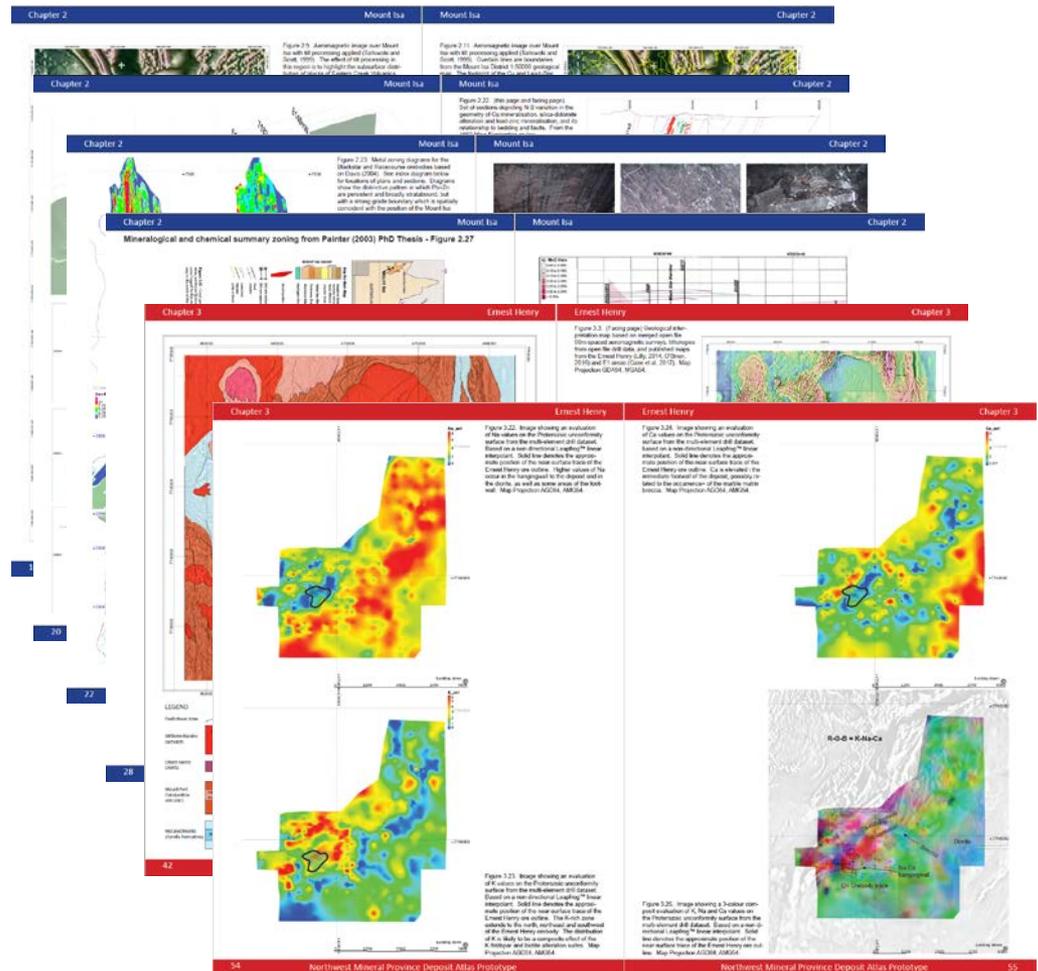
January 2018





The Sustainable Minerals Institute

The University of Queensland, Australia
P +61 7 3346 40003 F +61 7 3346 4045 E enquiries@smi.uq.edu.au www.smi.uq.edu.au



Trace element zoning - plan



Atlas of existing deposits and footprints



SMIBRC
WH Bryan Mining & Geology Research Centre



Northwest Mineral Province Deposit Atlas Prototype

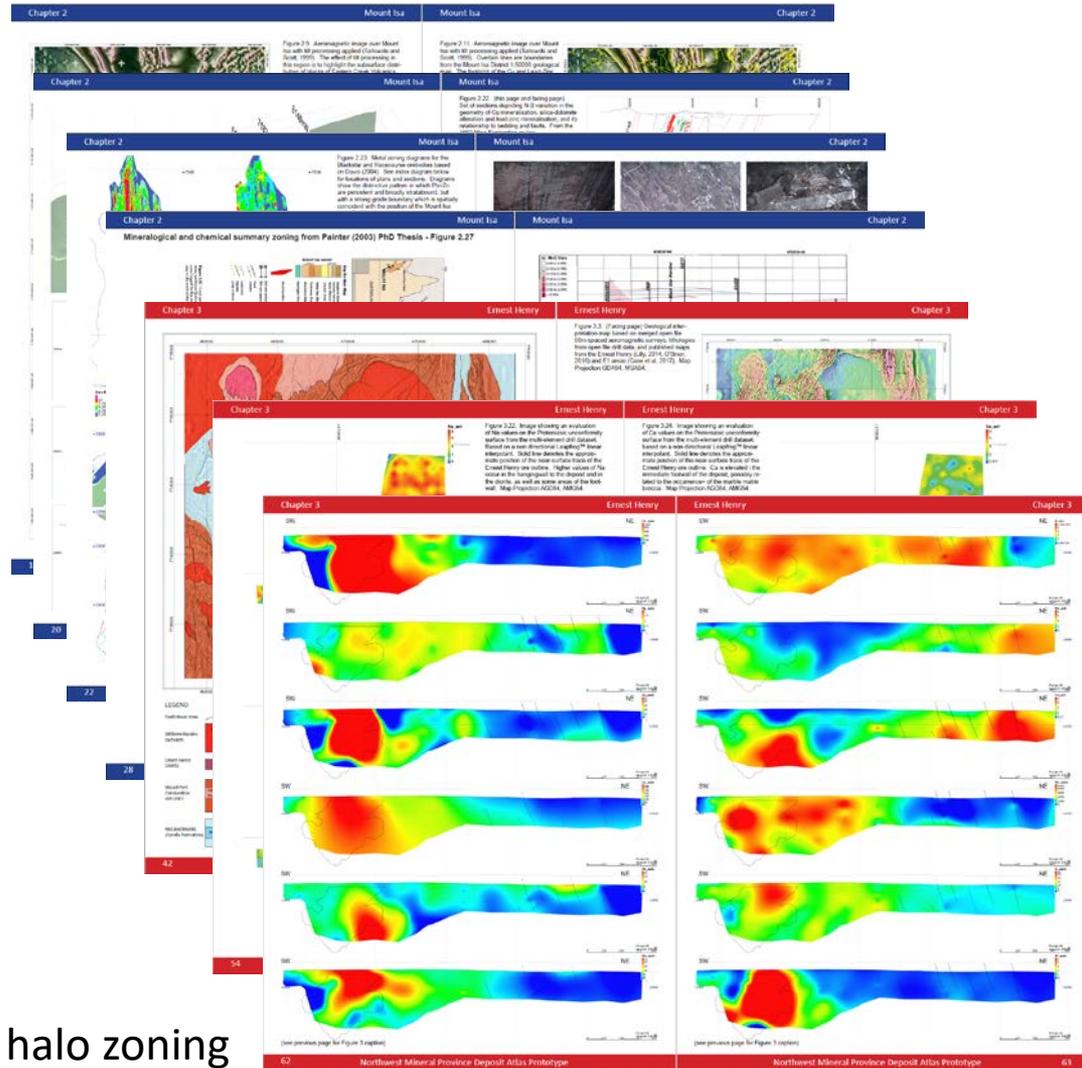
Mount Isa Cu-Pb-Zn-Ag and
Ernest Henry Cu-Au

January 2018

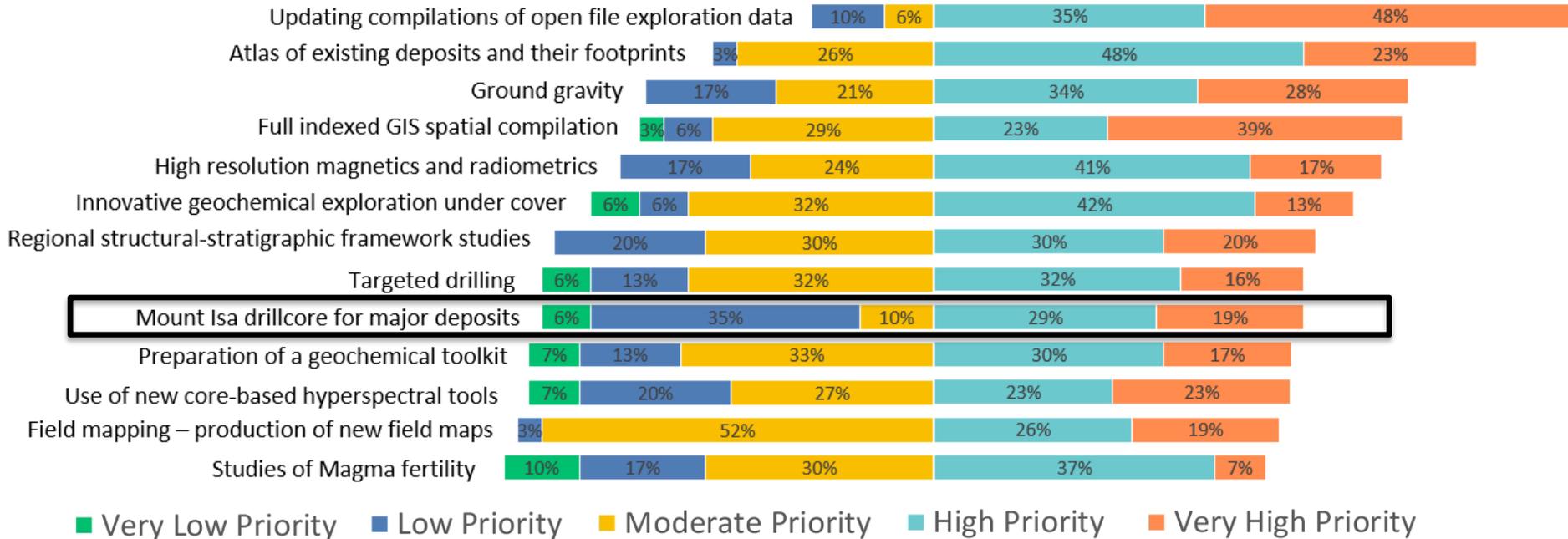


The Sustainable Minerals Institute The University of Queensland, Australia
P +61 7 3346 40003 F +61 7 3346 4045 E enquiries@smi.uq.edu.au www.smi.uq.edu.au

Inner halo zoning



Mount Isa Region Drillcore Collection

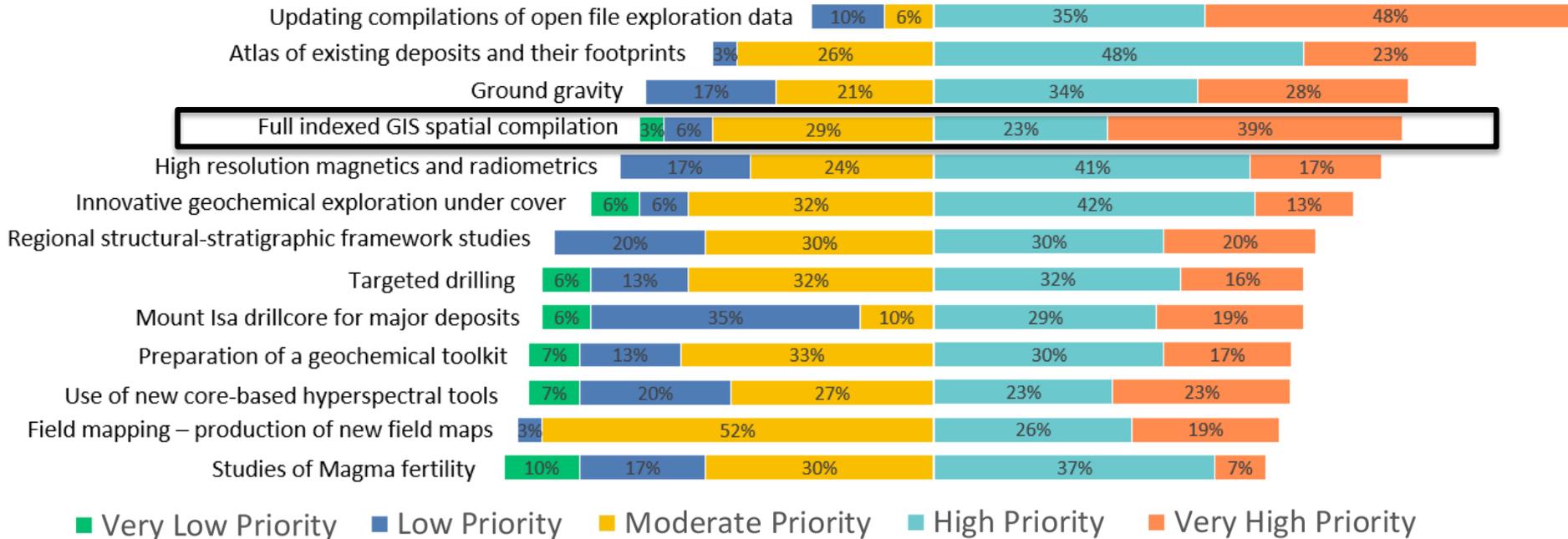


Mount Isa drillcore repository

- Key resource for explorers in the region
- Representative core and accompanying information all major deposits
- Collection under way



Full indexed spatial data compilation



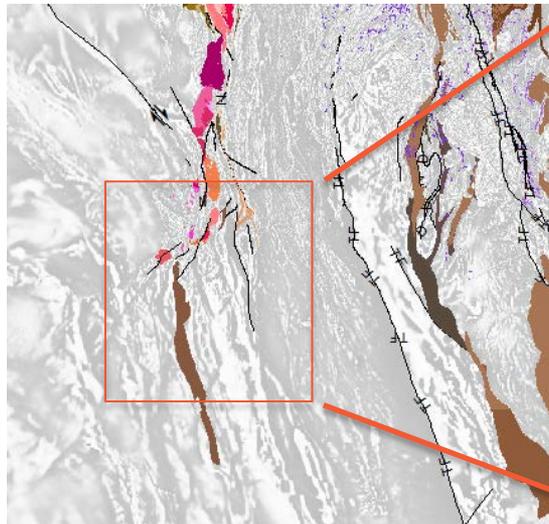
Full indexed GIS spatial compilation

- Faceted spatial data index
- Updated time-space chart
- GIS time-sliced stratigraphy, structure, igneous events
- 2D isopachs/depths from existing 3D models
- Exploration target compilation
- Compilation of miscellaneous legacy datasets
 - Metamorphic map
 - NABRE sections
 - CRC LEME regolith maps
 - Others as available
- Update of solid geology interpretation where justified



Faceted spatial data index

- Full compilation of reports, theses, publications, etc
- Categorised by study focus, data type, mineralisation style,...
- Spatially indexed
- Faceted search by theme



Data type	
GIS	5
Raster	3
Report	8
Thesis	2
Article	7
Map	2
3D Model	1

Study focus general	
Stratigraphy	2
Structure	3
Geochemistry	4
Geophysics	6
Prospectivity	1



✕ GIS

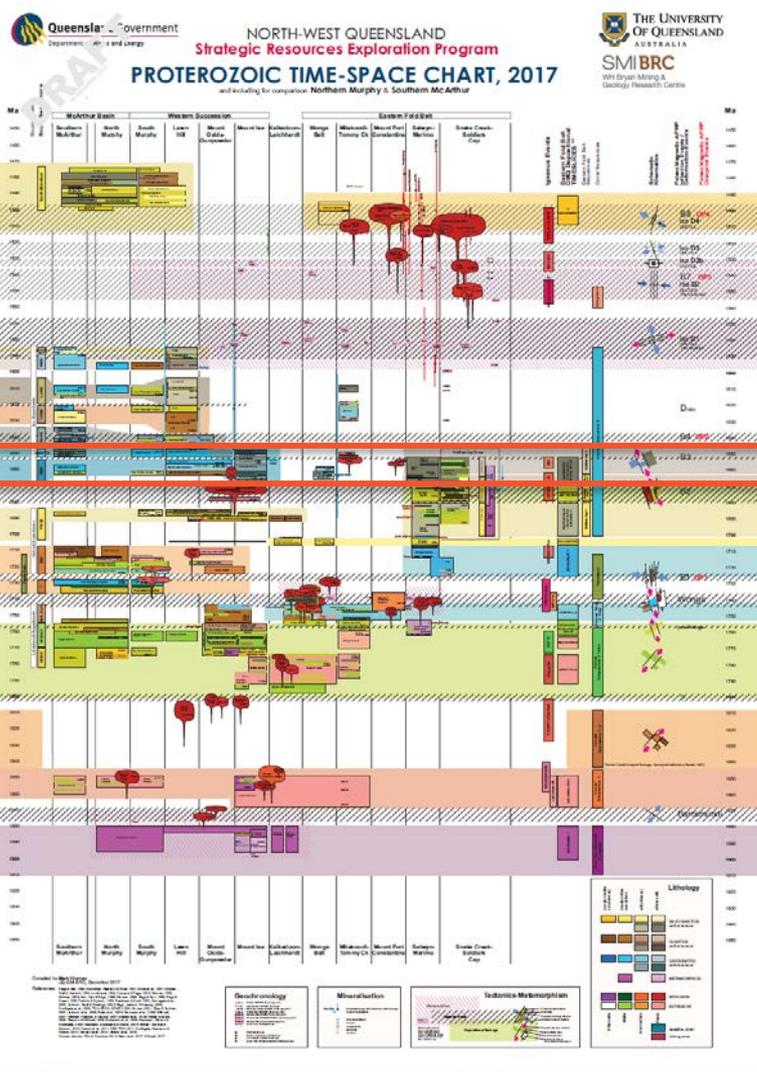
✕ Prospectivity



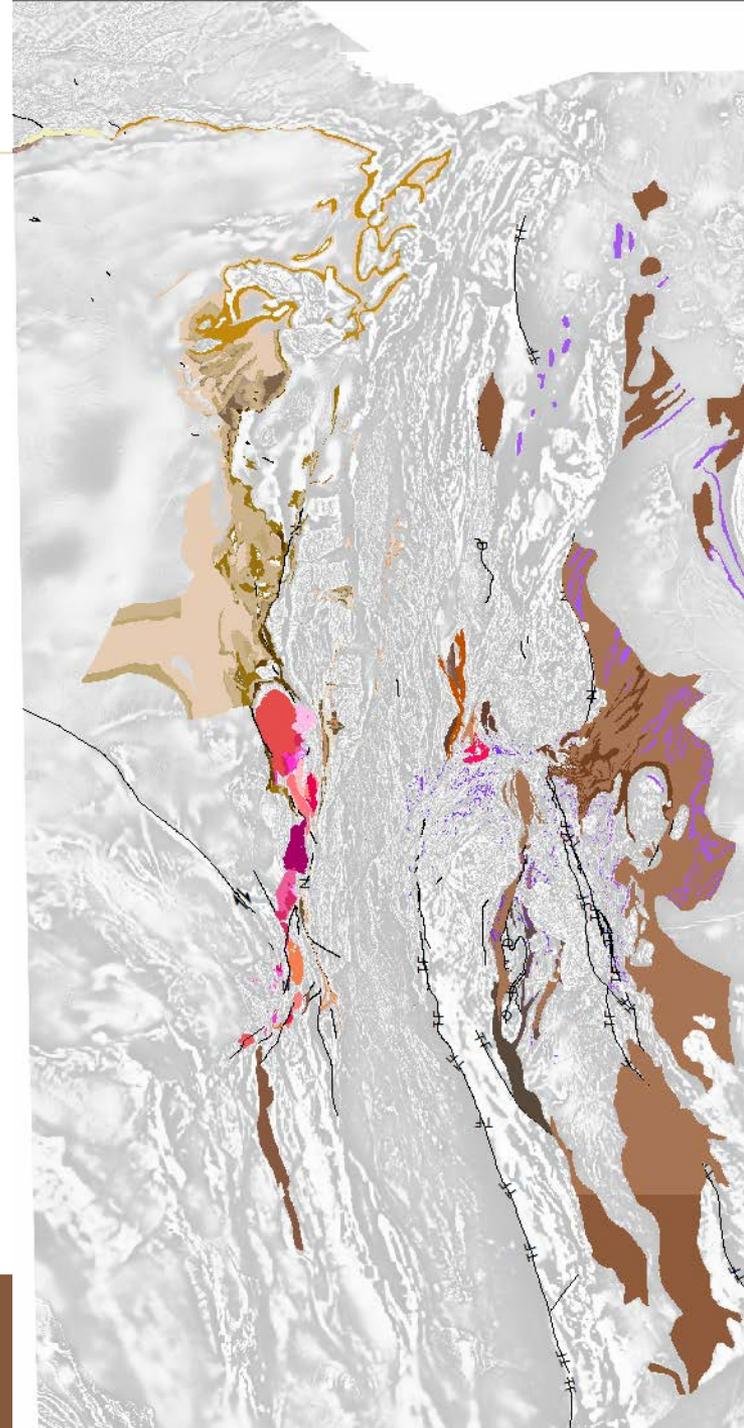
- Download
- View
- Link



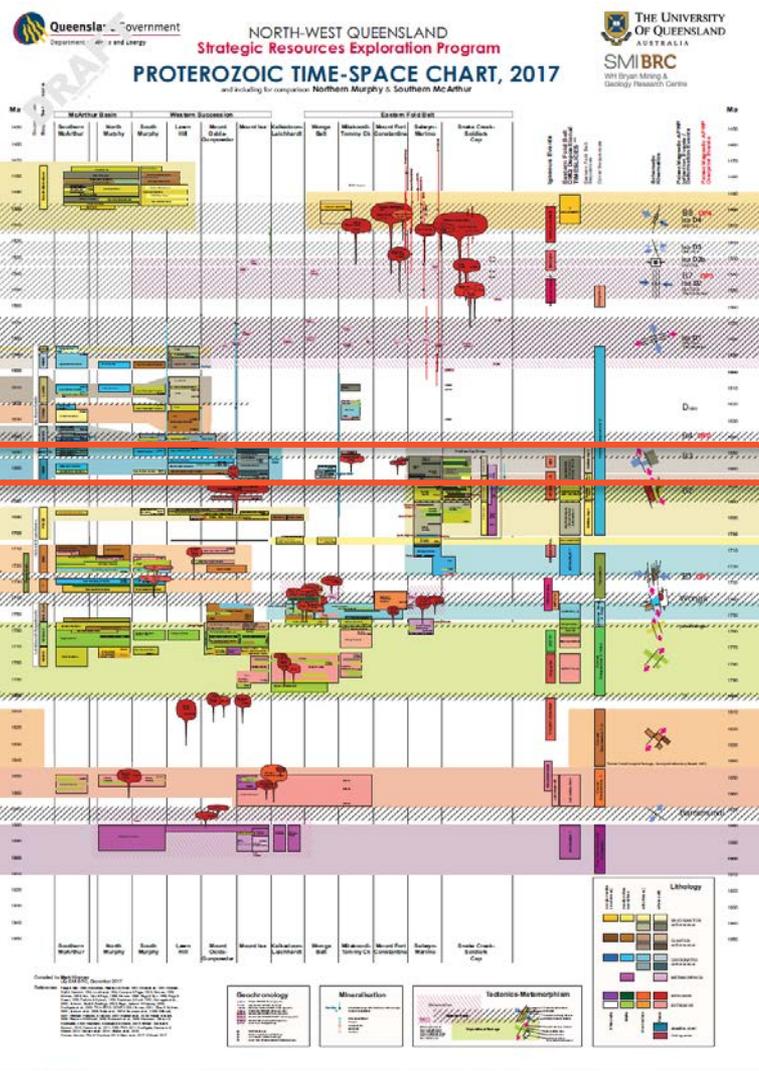
Updated time-space chart



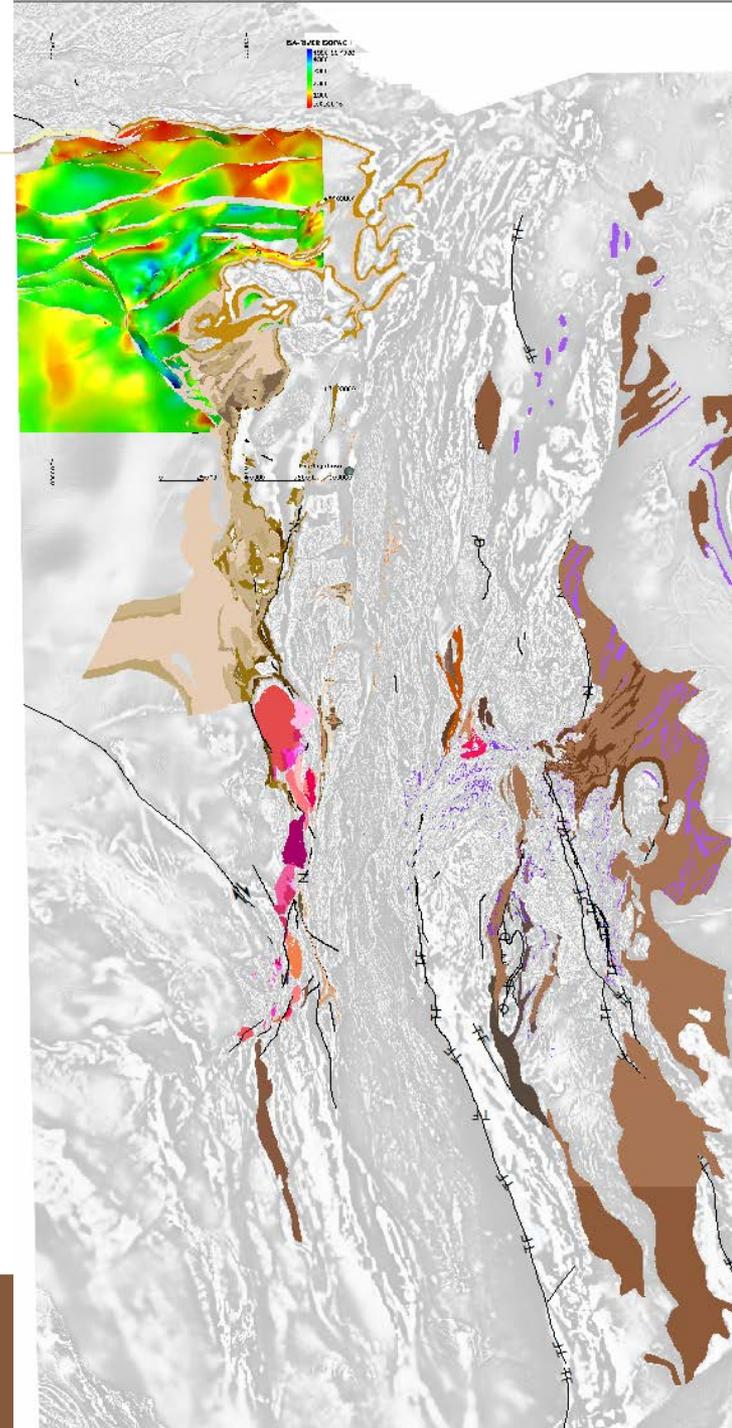
1670-1650



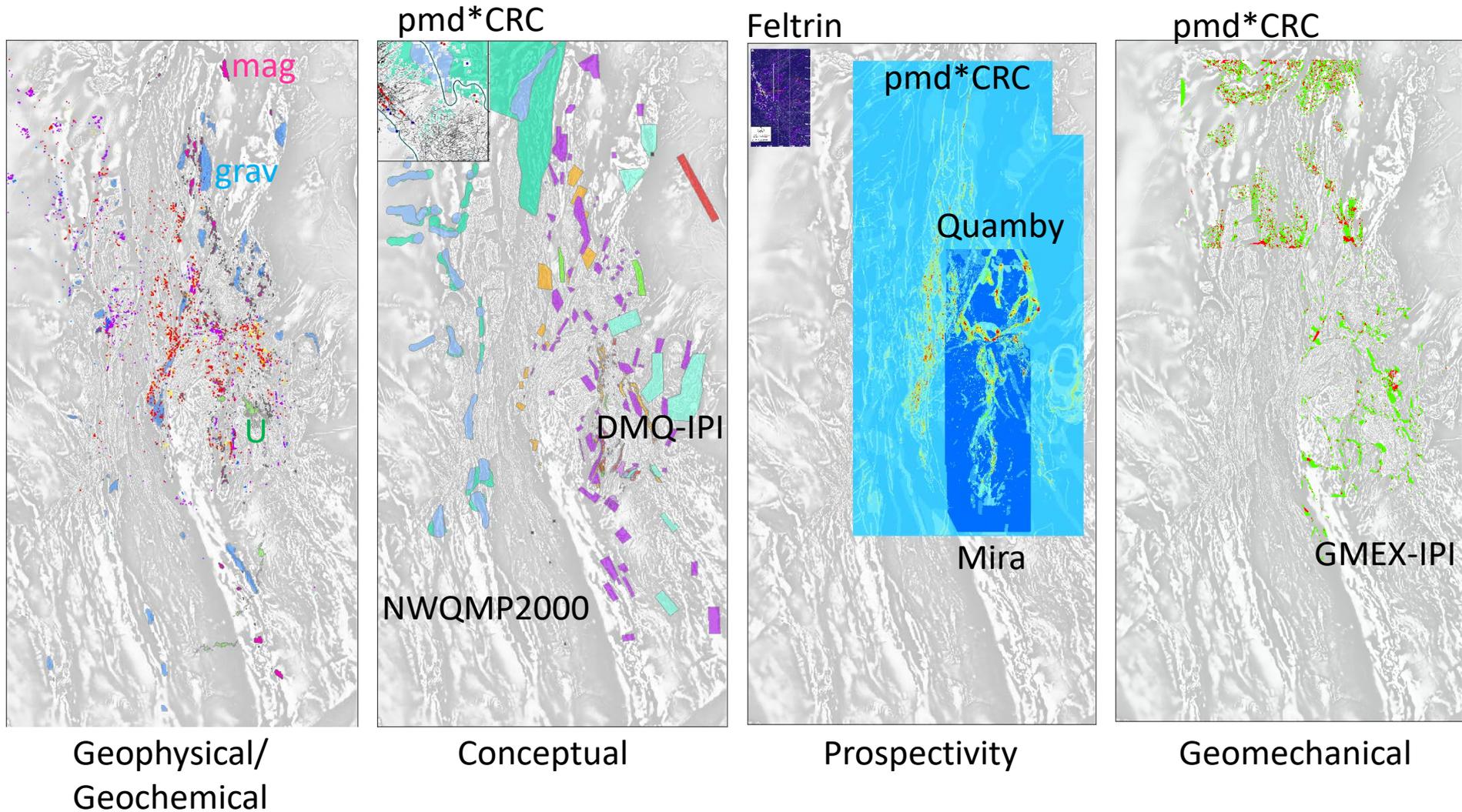
Isopachs from 3D models



Pmd*CRG –
Thickness Isa
Superbasin



Exploration target compilation



Current Status and Next Steps

- **Current Status**
 - Time-space compilation complete
 - Atlas Prototype complete
 - Target compilation complete
 - Spatial data index well progressed
 - Core collection under way
 - Legacy datasets near completion
 - Solid geology updates under way
- **Next Steps**
 - Expand Atlas Prototype (Mt Isa/EH) to full atlas of all deposits
 - Full core collection
 - Additional studies based on gap analysis



Success Scenarios

1. In exposed and data-rich areas of the Mount Isa region: Value-added interpretation of geoscientific datasets, combined with state-of-the-art data analytics, uncovers a previously unrecognised or under-appreciated target which turns into a major discovery

2. In areas under relatively thin cover: New insights into key controlling features and halos related to known deposits, combined with new geophysical and deep-looking geochemical data, result in a new major discovery

3. In deeply covered areas: New interpretations and 4D models allow mapping of high priority target regions, and a new major discovery is made with the aid of these interpretations and new datasets

