

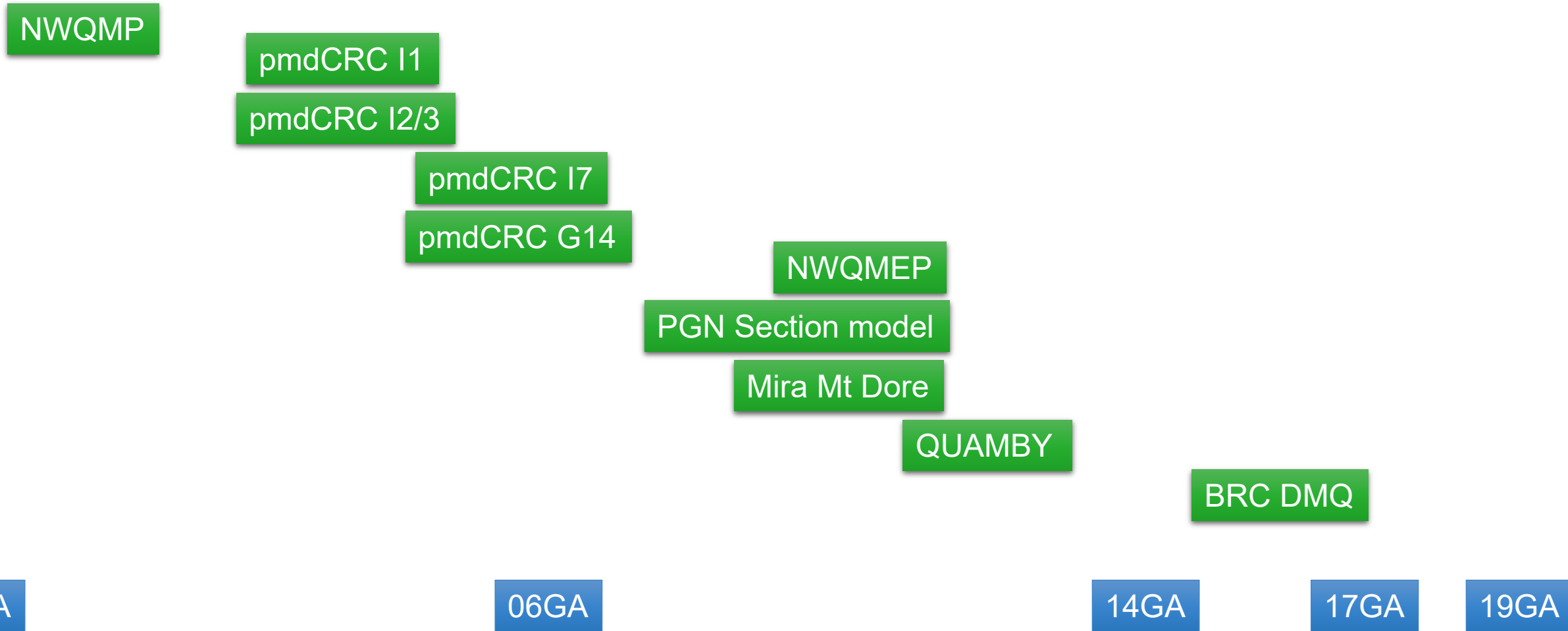


THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

NWMP 3D models and associated studies

- Provide history of publicly available framework studies, with 3D model emphasis
 - What did they consider?
 - What were their objectives
 - What information is available?
- Develop familiarity with the datasets and ways to view and integrate them
- Consider how they might be used in exploration, for example(?):
 - Regional targeting
 - General review/background
 - Planning and execution of camp/prospect-scale exploration
 - Interpretation of results
 - Communication



North-West Queensland Mineral Province Report

Nothing else on Earth
MEASURES UP



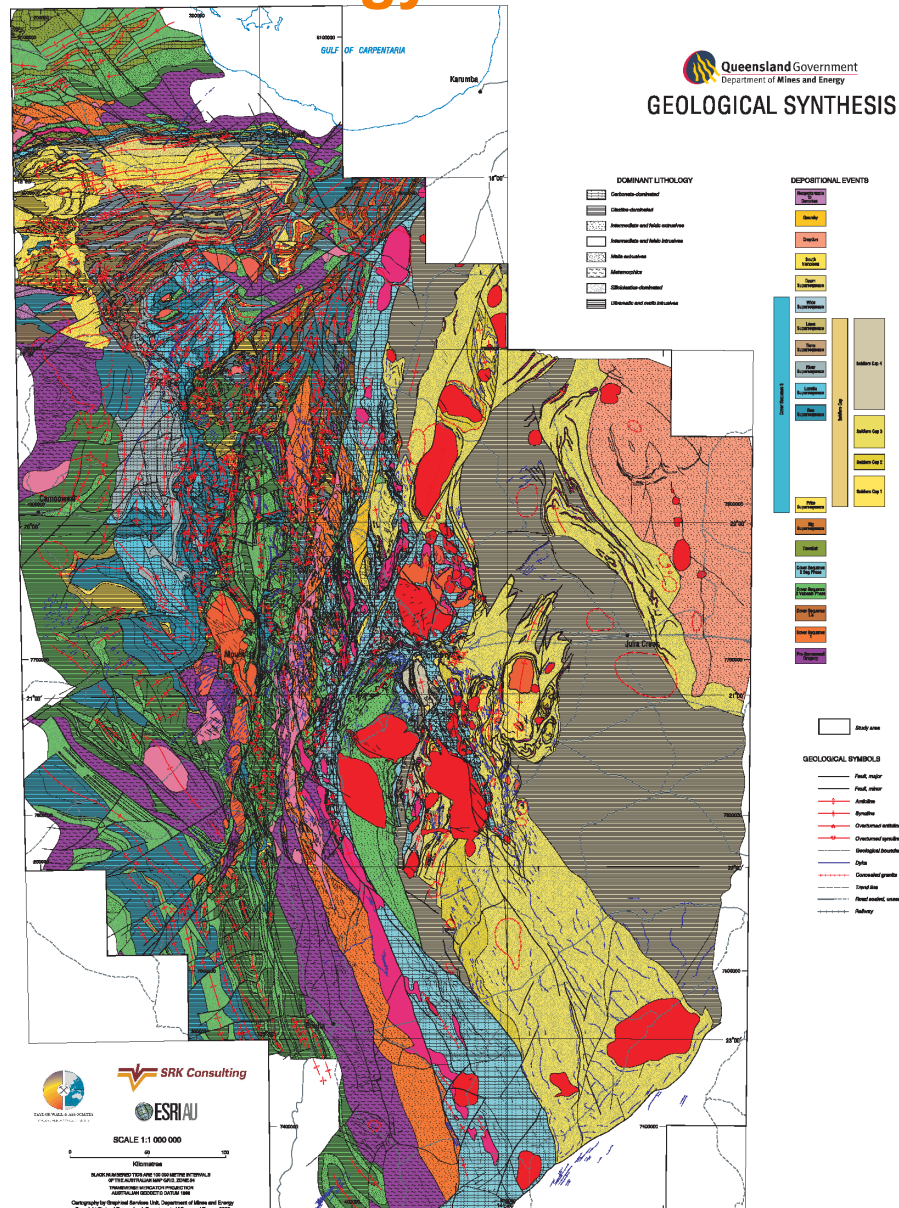
Queensland
Government
Department of
Mines and Energy



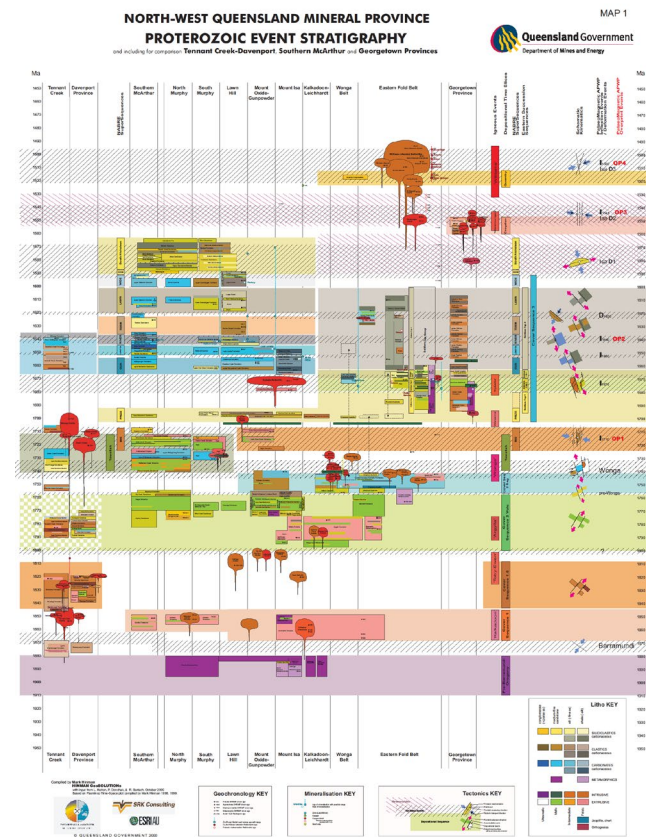
TAYLOR WALL & ASSOCIATES
GEOSCIENCE CONSULTANTS

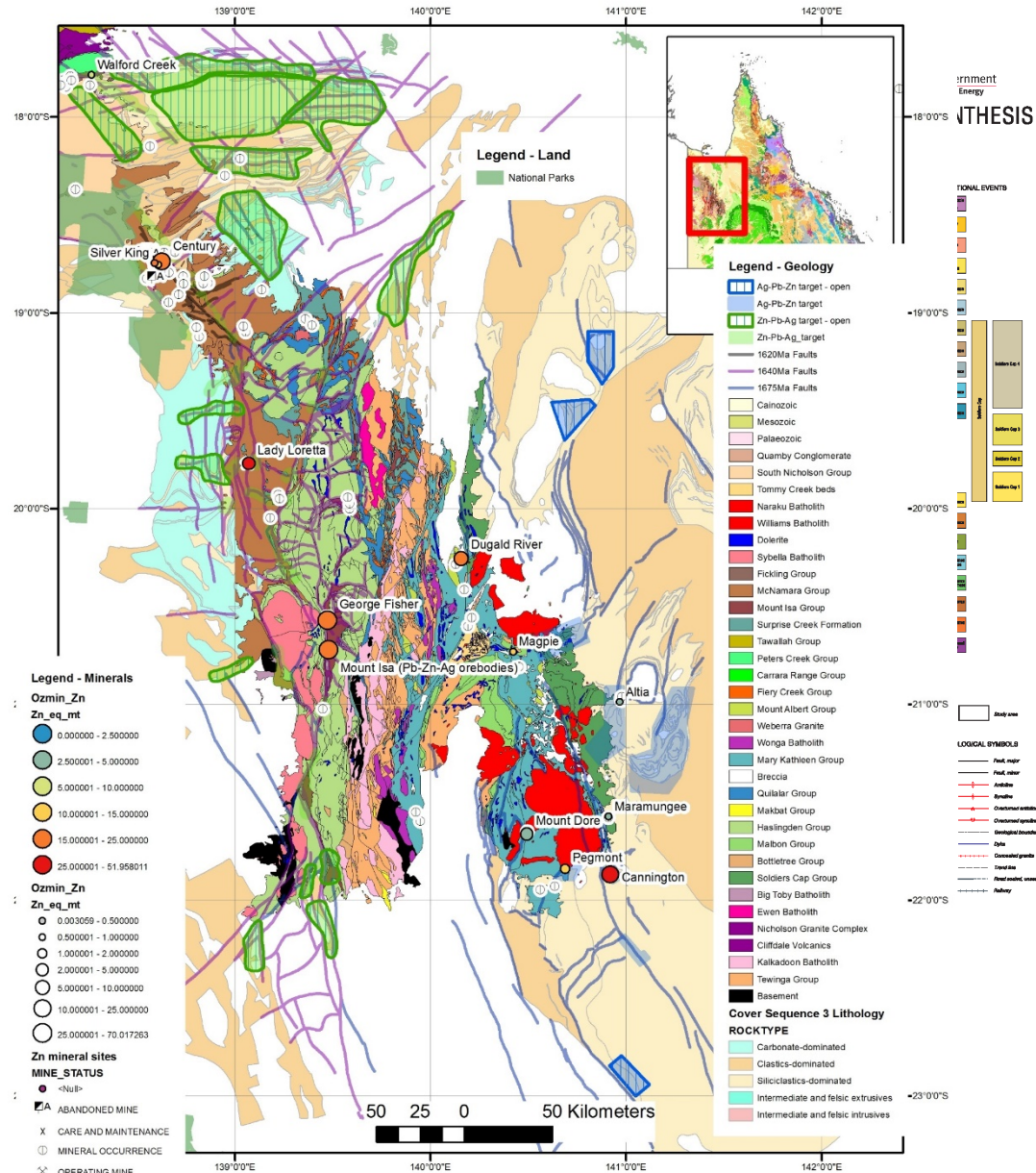


2D 250K Solid Geology



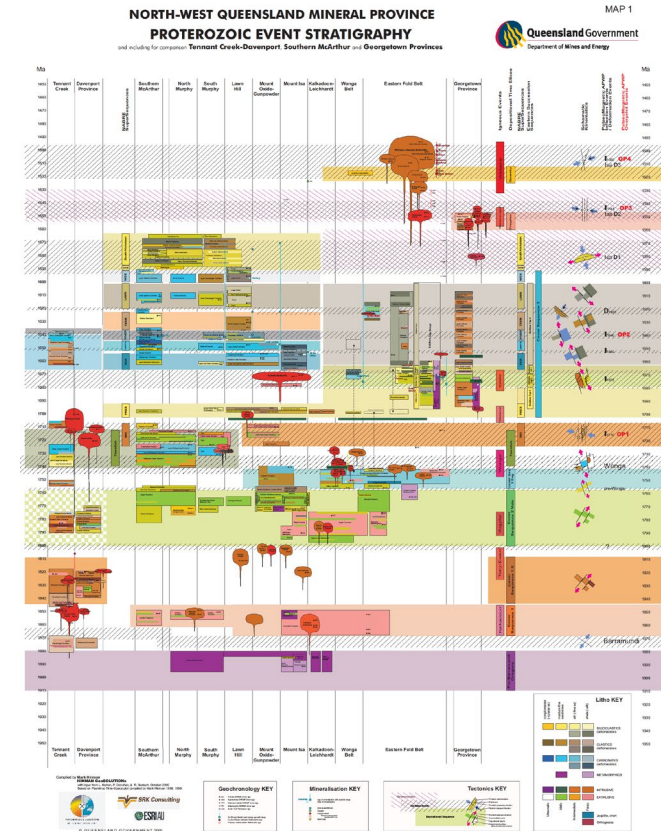
- MAP 2
- Leveraged pre-release MIM aeroMag-Rad >> 250K(-100K) Solid Geology
 - first geoChron Time-Space compilation
 - Tectono-Stratigraphic Framework
 - Package Timeslicing
 - Tectono-Stratigraphic Targeting: Pb-Zn, Cu-Au






MAP 2

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predictive mineral discovery
COOPERATIVE RESEARCH CENTRE



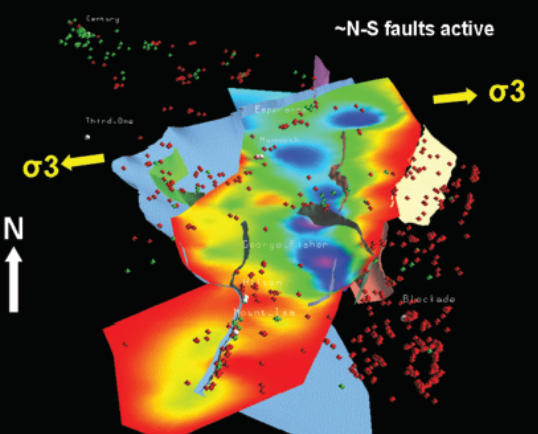
Final Report

3D Basin Architecture & Mineral Systems in the Mt Isa Western Succession


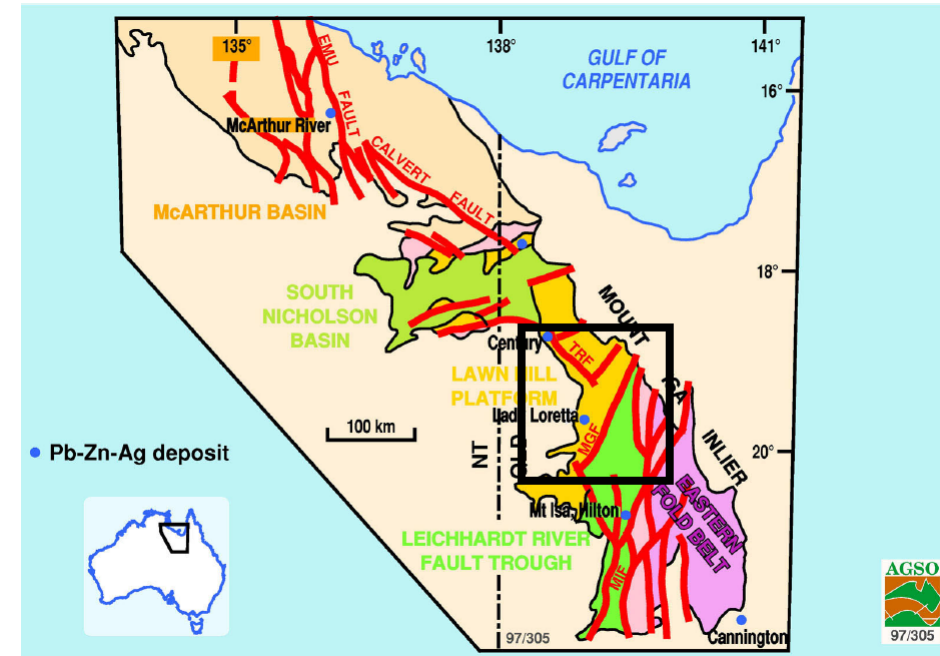
Project I1

March 2002 - March 2005

George M. Gibson & Adrian P. Hitchman (editors)



Isopach map with major structural elements in Mt Isa at Myalgly time (1770-1780Ma) showing major mineral occurrences (red = Cu, green = Pb-Zn)

3D basin architecture

- interpretation of the potential field data (gravity and aeromagnetics)
- structural analysis - key localities
- 3D Gocad model
- deformational fabrics and tectonothermal history of the region
- Fault timing
- Thermobarometric data (Kubler indices and white mica b dimensions)

3D isopach map - sedimentary depocentres - basin shape/growth faults

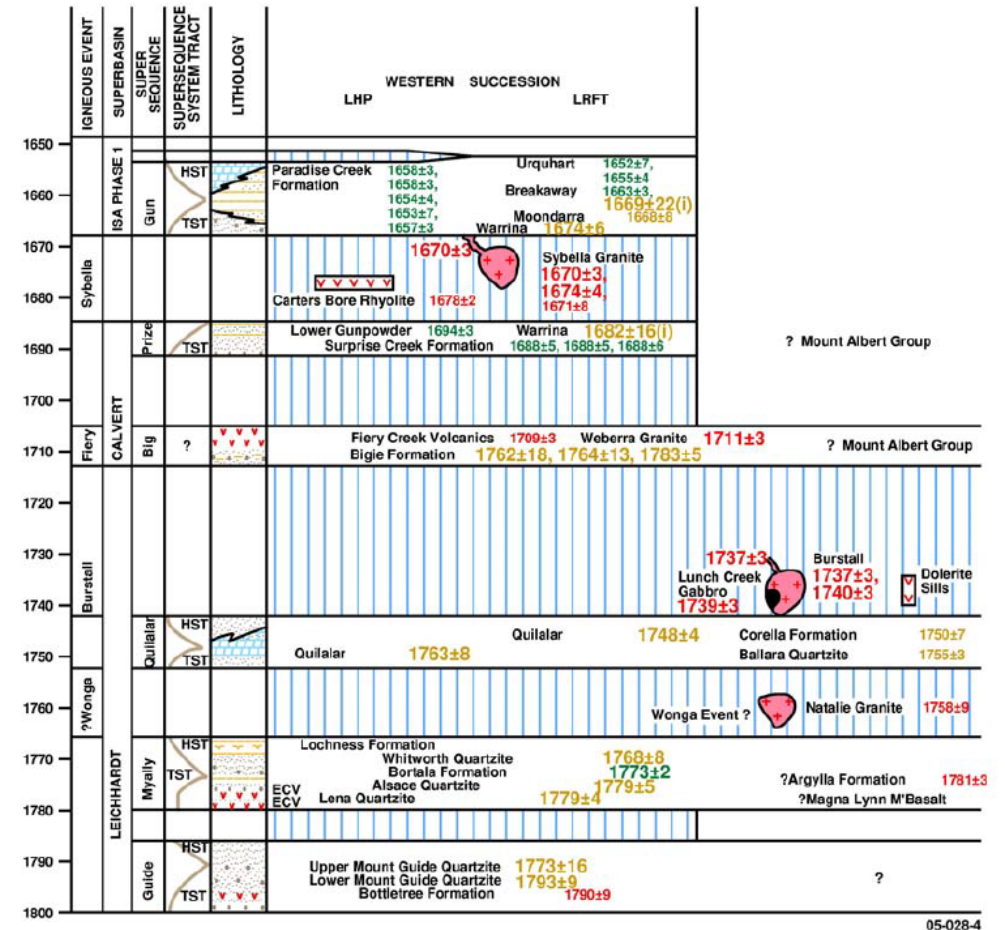
- mapped sedimentary thicknesses
- sequence stratigraphy of detailed measured sections
- focus on older underlying units (Myally and Quilalar Supersequences) that formed the original rift template

Mineral index maps and numerical modelling

- processing of remotely sensed LANDSAT, ASTER, HYPERION and radiometric data
- PIMA analyses in support
- Flac3D - simplified geological models

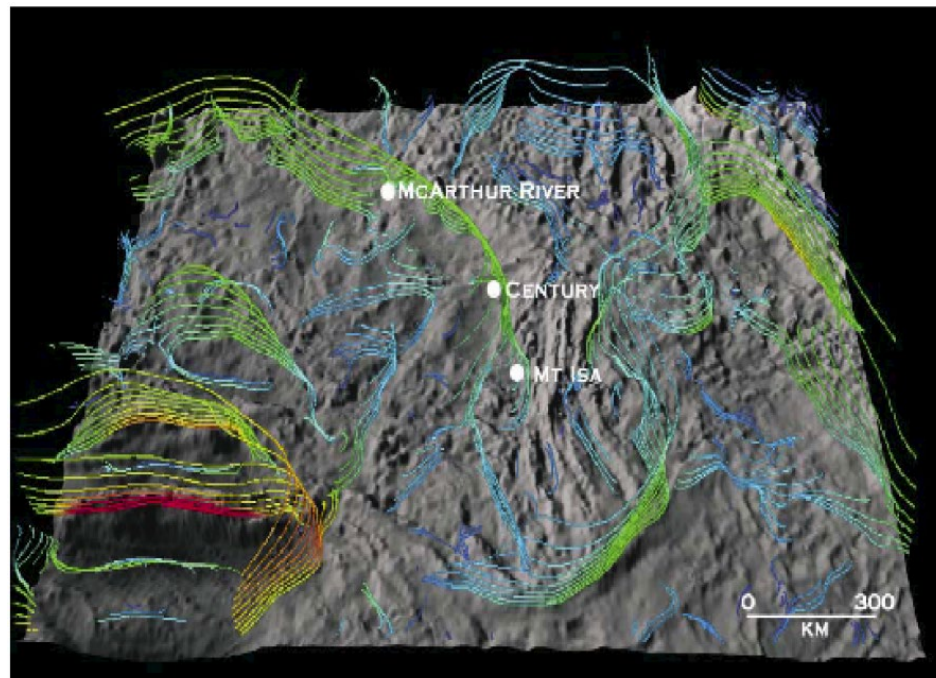
Extended and revised space-time and event plots

- U-Pb SHRIMP dating of detrital zircon populations from different parts of the stratigraphy
- depositional ages as well as the provenance of the sediments.



05-028-4

pmdCRC I1



Exploration Geophysics (1999) 30, 38-44

Multiscale edge analysis of potential field data*

Nick Archibald

Fractal Graphics Pty Ltd
PO Box 437
Nedlands, WA, 6009

Paul Gow

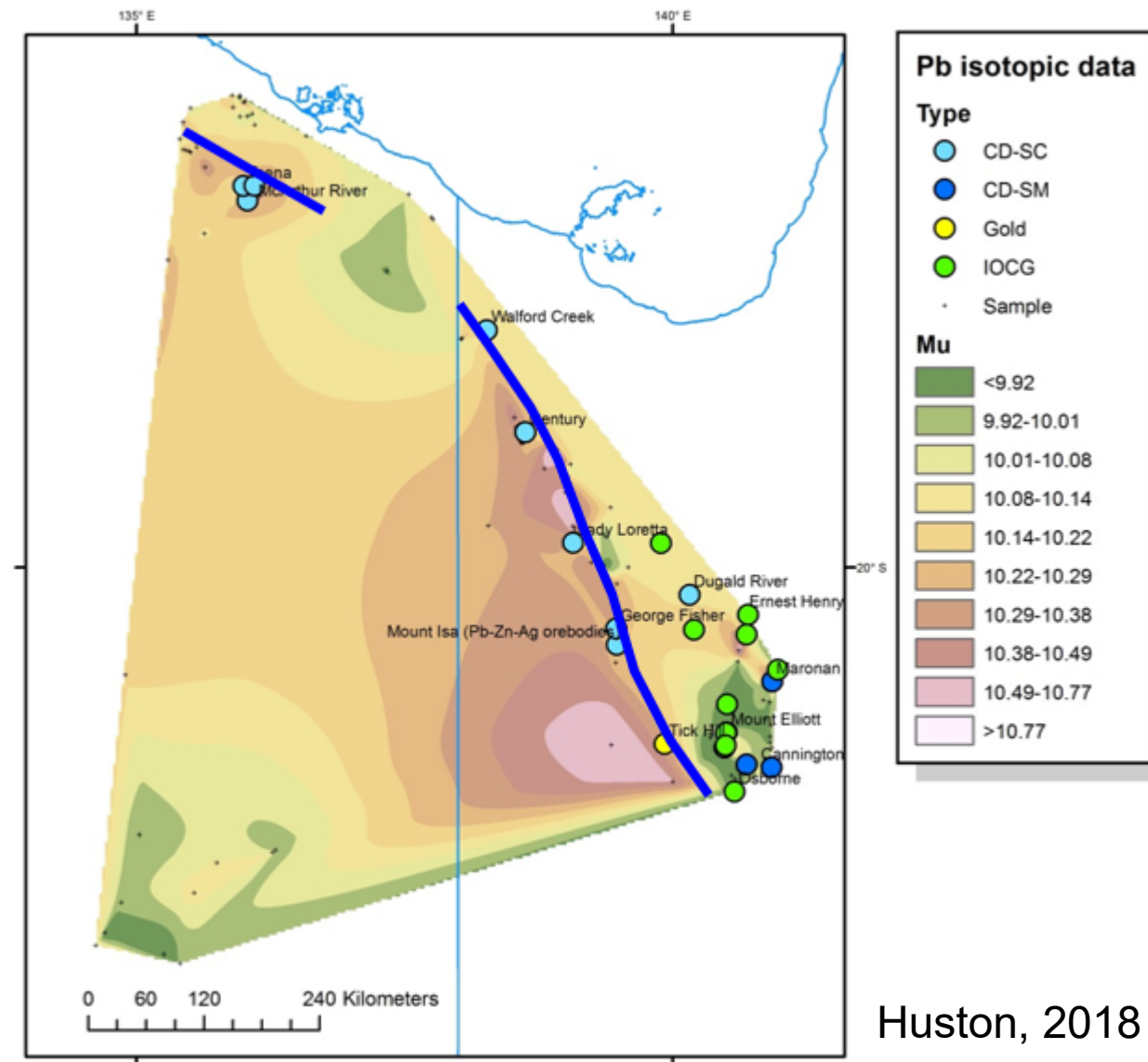
CSIRO Division of Exploration and Mining
PO Box 437
Nedlands, WA, 6009

Fabio Boschetti

CSIRO Division of Exploration and Mining
PO Box 437
Nedlands, WA, 6009

ABSTRACT

Mapping the three-dimensional distribution of rock properties from potential field data is a difficult and arduous task, with inherent ambiguity remaining a major problem. We apply a combination of automated interpretation procedures, based on multiscale wavelet analysis and three-dimensional visualisation methods, in an attempt to extract geometrical information from potential field datasets, and



Huston, 2018

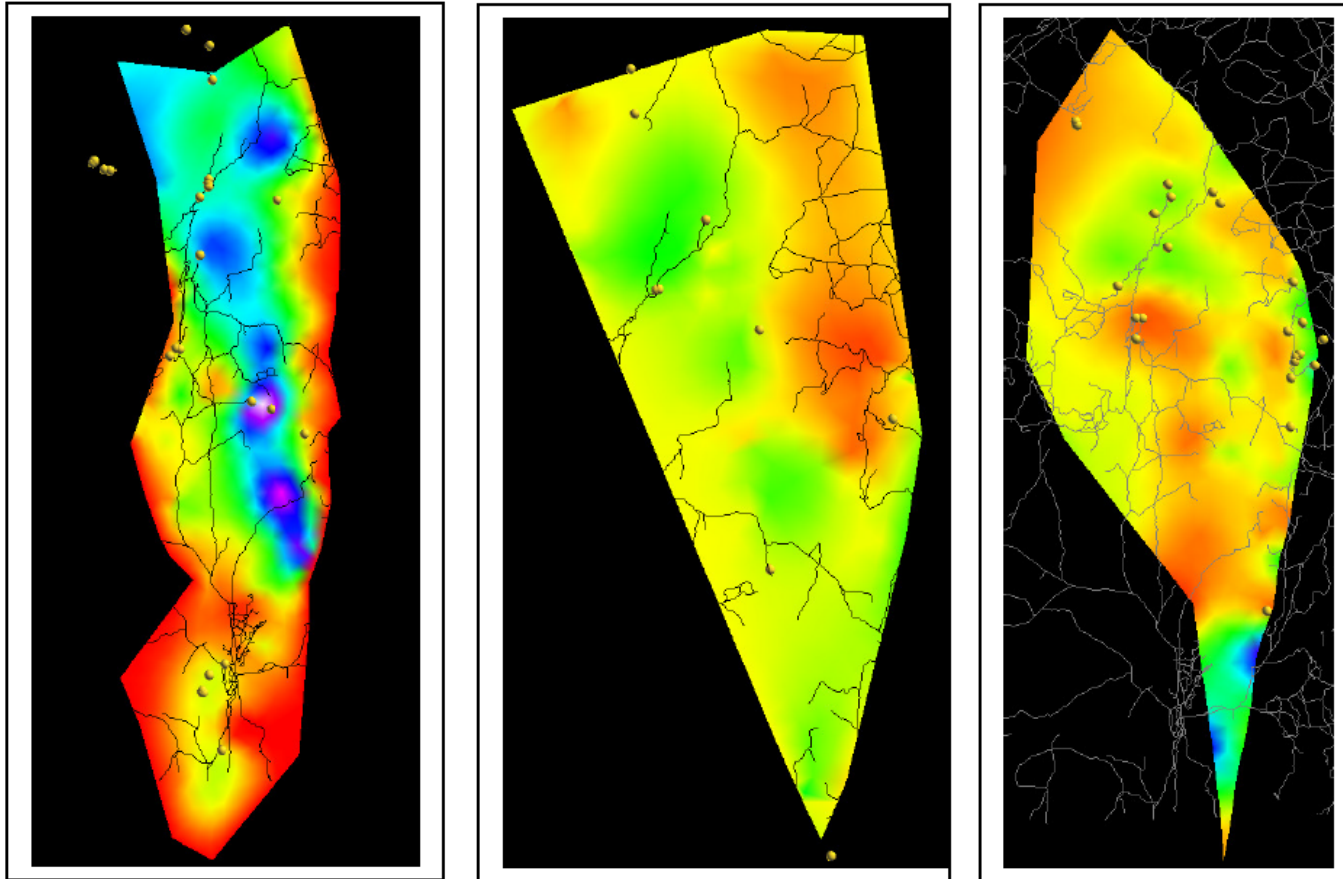


Figure 5-11, 5-12, and 5-13: 3D Isopach maps for Myally, Quilalar and Surprise Creek, overlain by copper occurrences within rocks of these ages. Note the match between depocentres and mineralisation, especially for the Surprise Creek Formation. Lines on each isopach map are roads, to assist with scale and orientation for viewers. Scale is different for each map to maximise viewing area; each map is oriented north to top of page.

predictive mineral discovery
COOPERATIVE RESEARCH CENTRE



Final Report

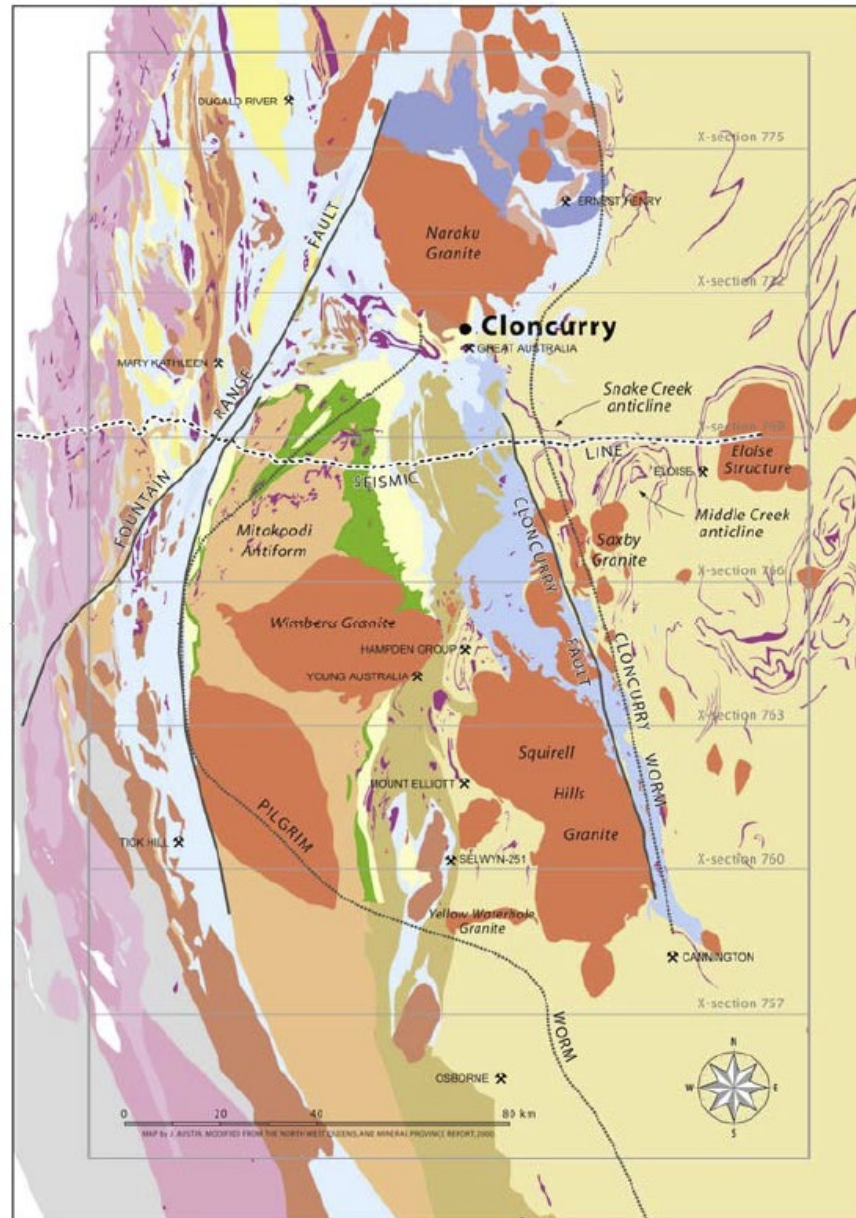
Total Systems Analysis of the Mt Isa Eastern Succession

Project I2

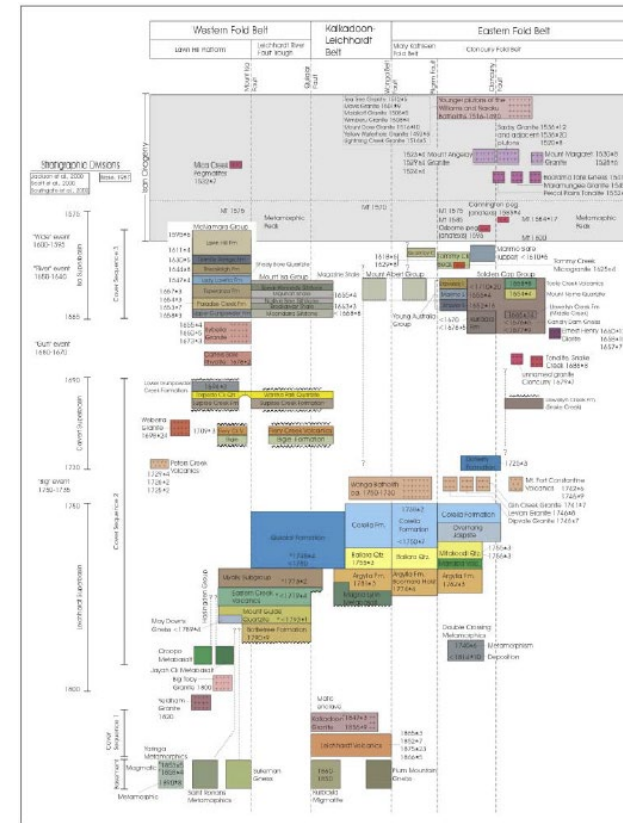
April 2002 - March 2005

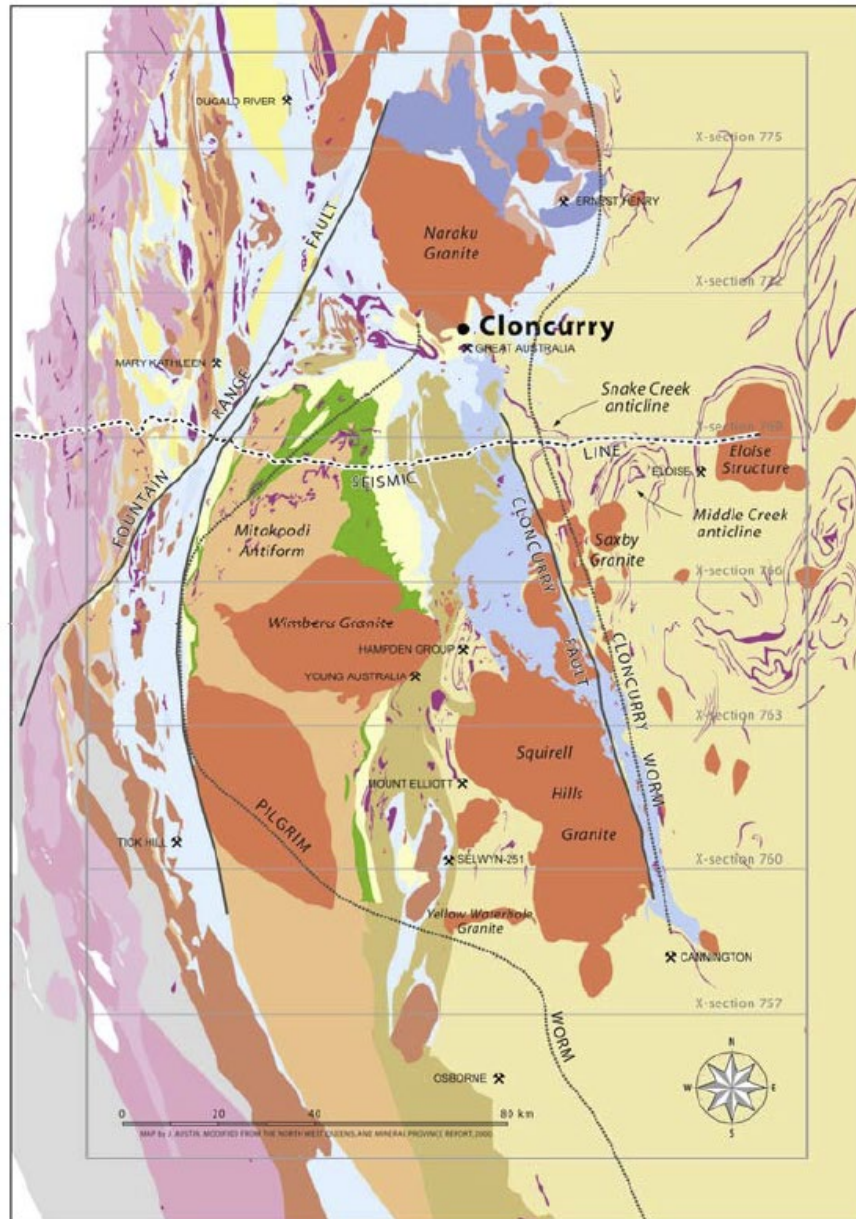
Tom Blenkinsop (editor)





- Eastern Succession 100K Solid Geology
- >> major Group packaging
- updated Chrono-stratigraphy (Time-Space)





- Eastern Succession 100K Solid Geology
 - >> major Group packages
- updated Chrono-stratigraphy (Time-Space)
- first major use of Mag & Grav WORMS

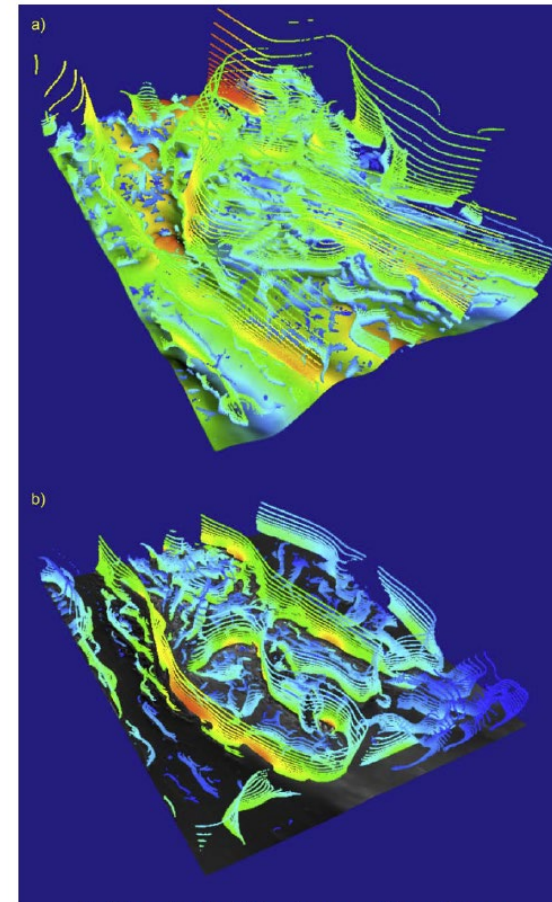
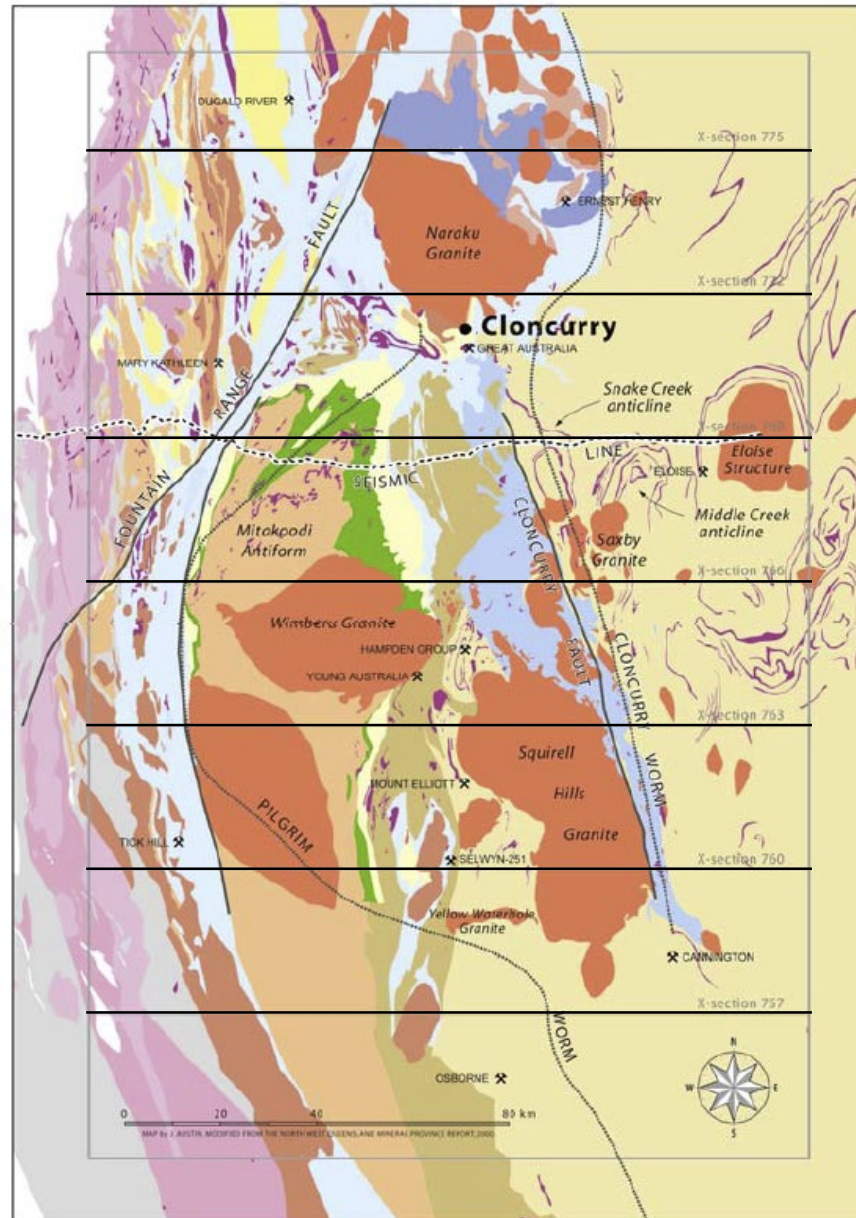
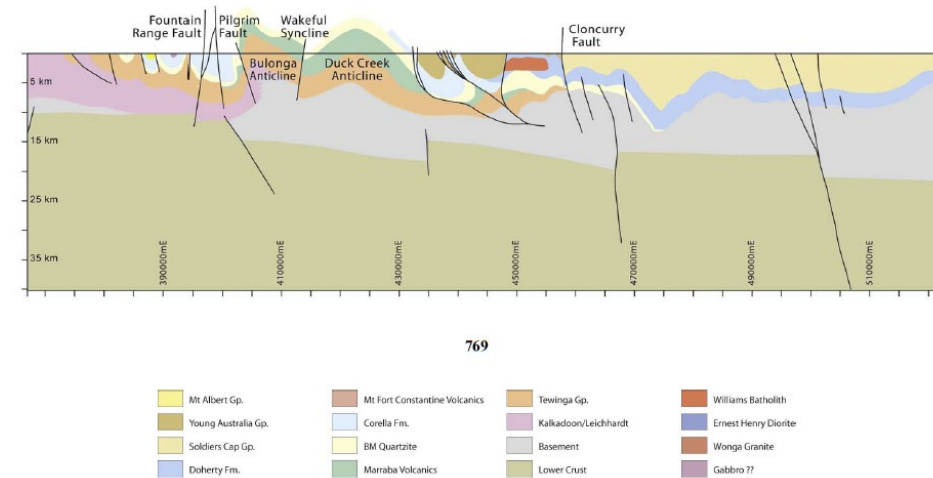
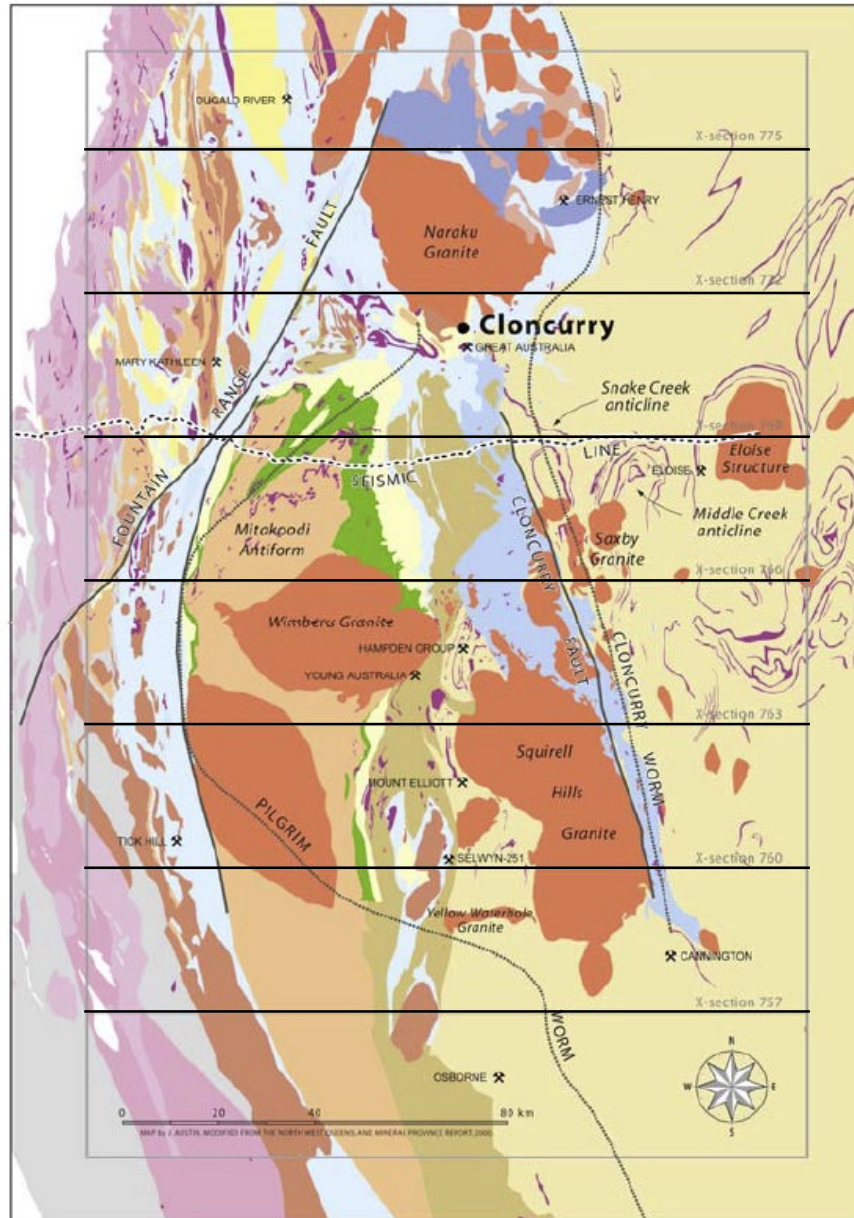


Fig. 4. Perspective views of (a) gravity worms and (b) magnetic worms.

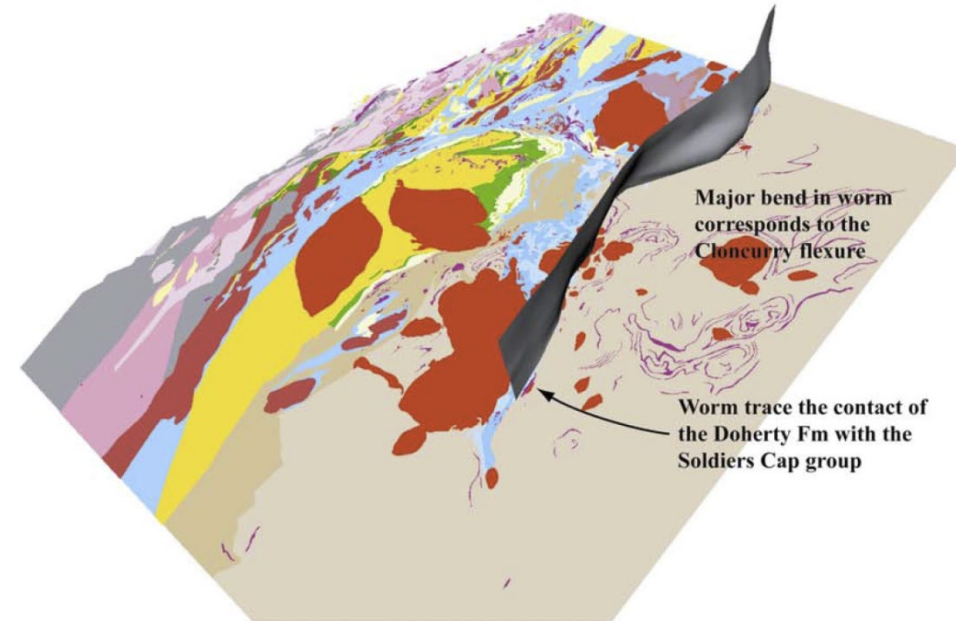


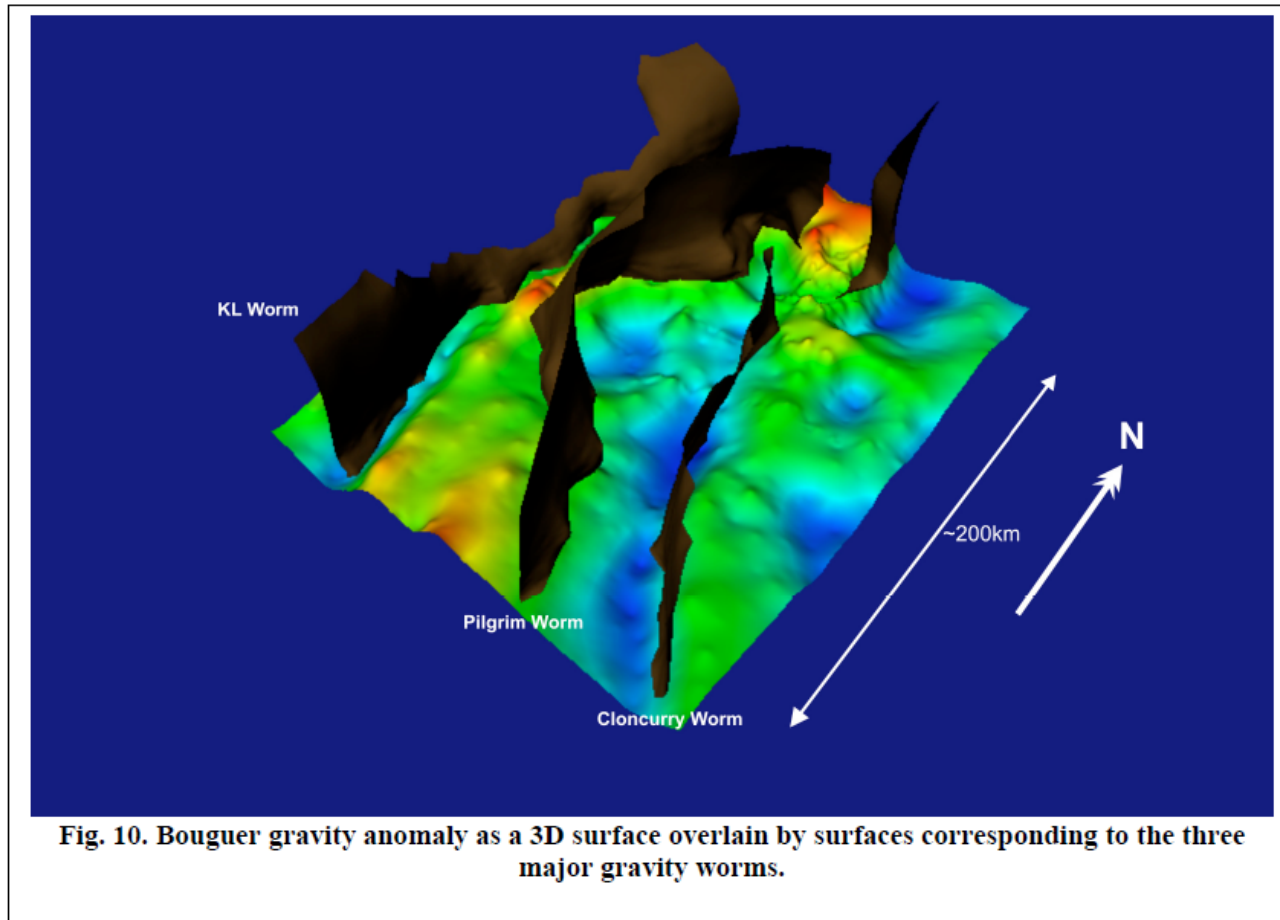
- 100K Solid Geology into
 - >> major Group packages
- updated Chrono-stratigraphy (Time-Space)
- major use of Mag & Grav WORMS
- **seven 30km-spaced Sections**
 - >> **crustal (35km deep) interpretations**





- 100K Solid Geology into
 - >> major Group packages
- updated Chrono-stratigraphy (Time-Space)
- major use of Mag & Grav WORMS
- seven 30km-spaced Sections
 - >> crustal (35km deep) interpretations
- preliminary 3D Model of Eastern Succession
 - >> VERY broad scale Model
 - >> significant correlation issues identified





pmdCRC***

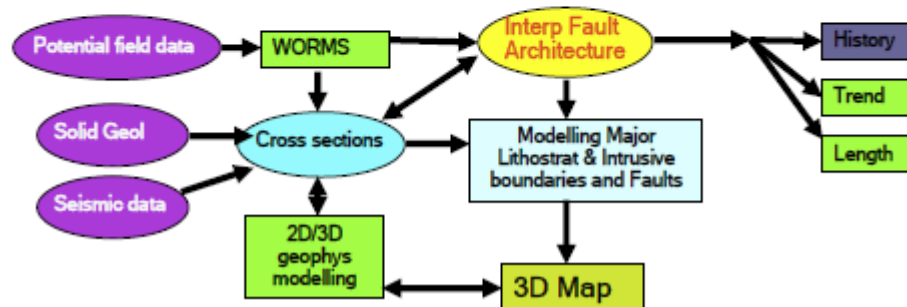
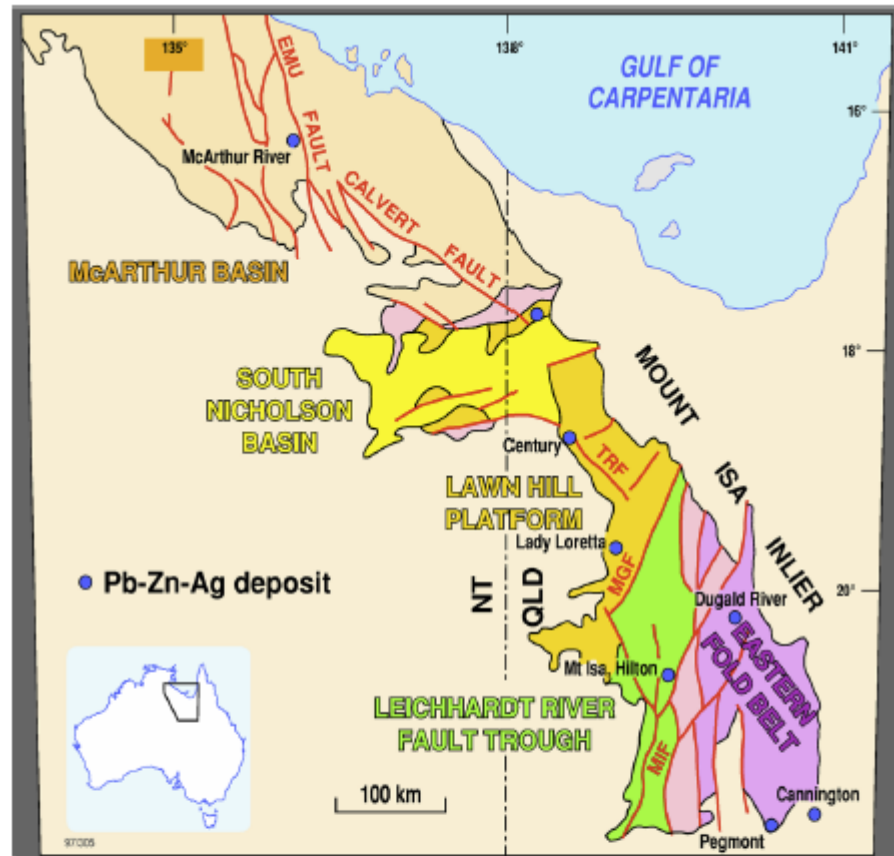
Project 17 Final Report
April 2005 – July 2008

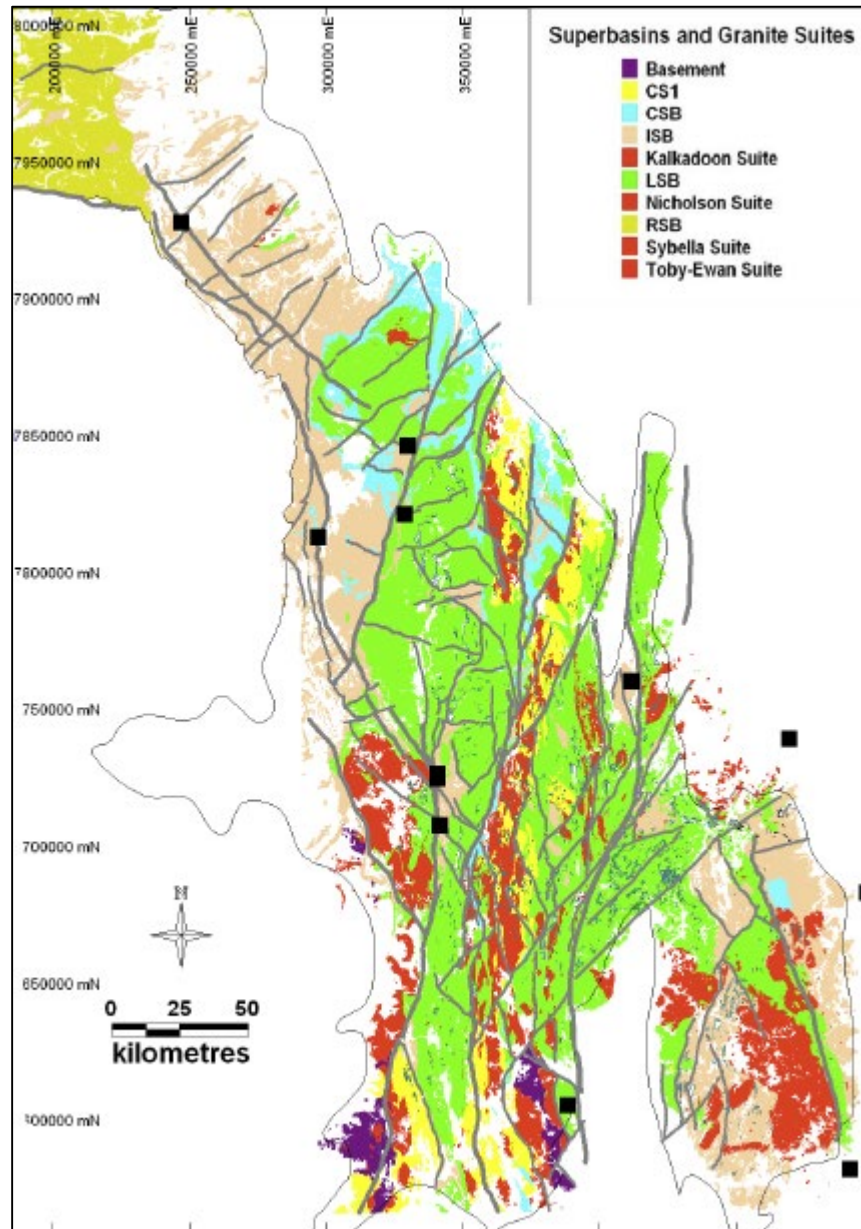
Mineral system analysis of
the Mt Isa–McArthur region,
Northern Australia



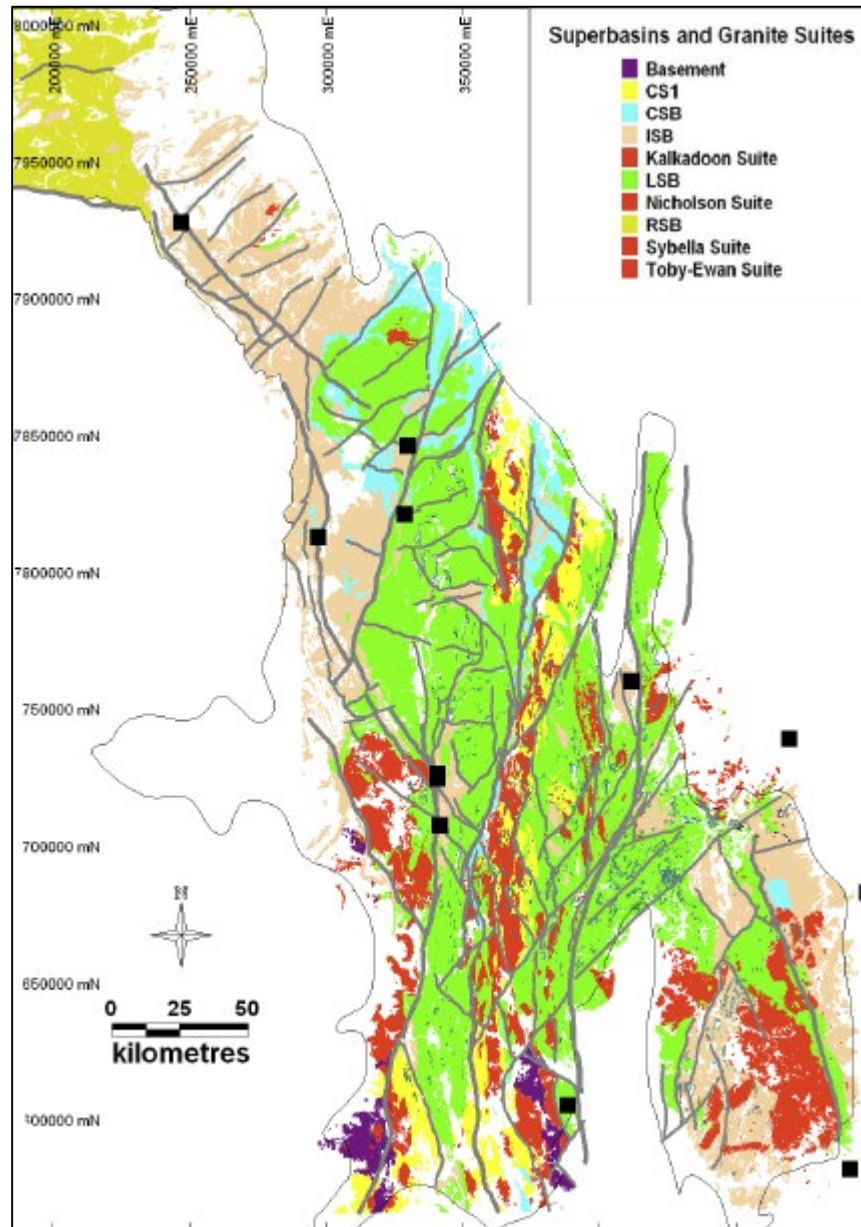
Compiled by the 17 Project Team

• Isa-McArthur Project Extent

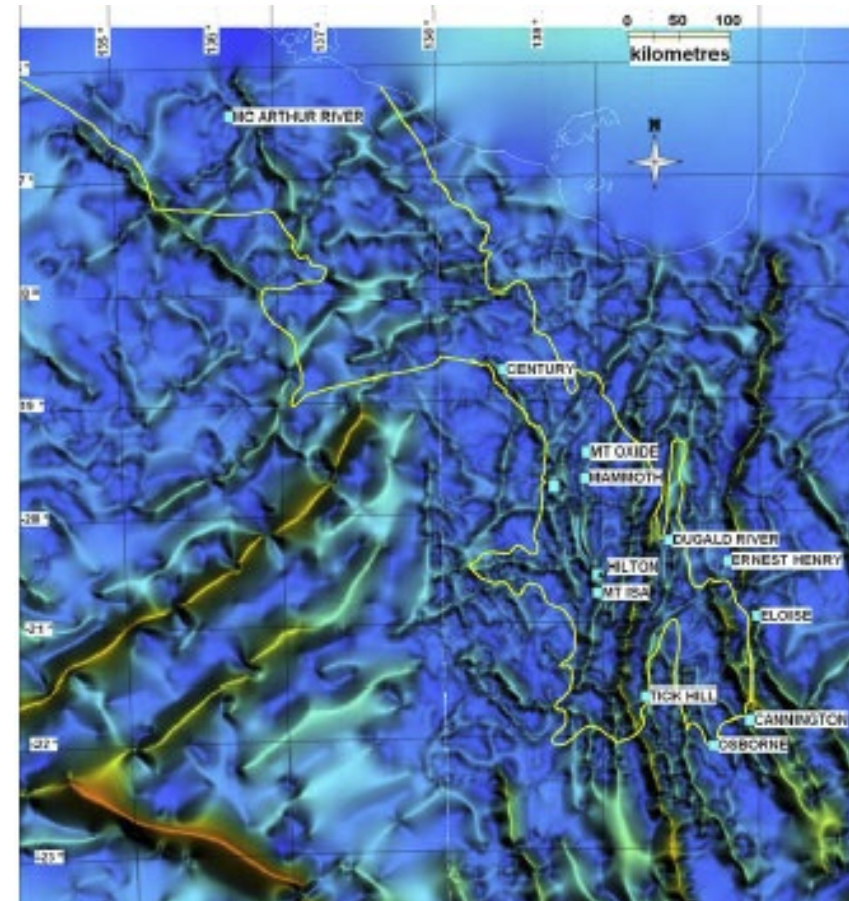


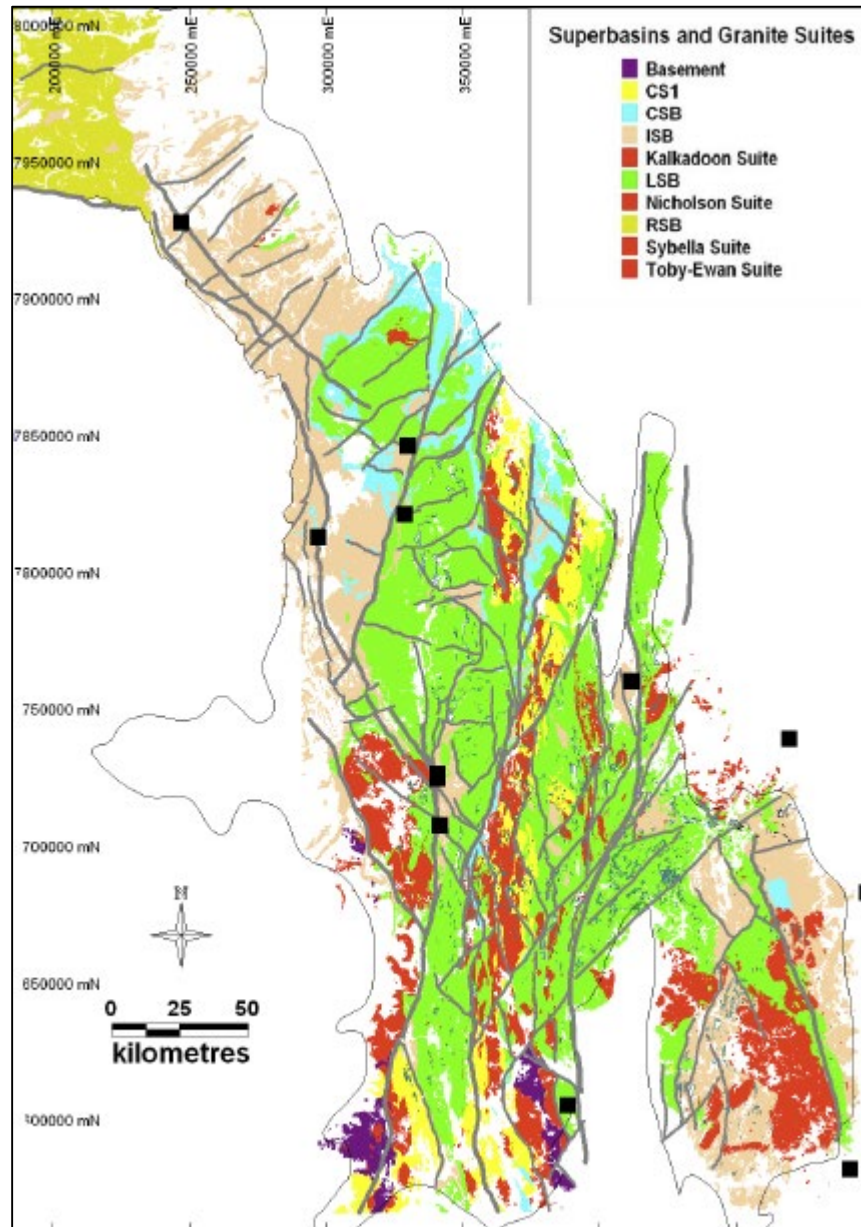


- Isa-McArthur Project Extent
- adopted Superbasin packaging in NWQ
>> 100K Solid Geology re-interp

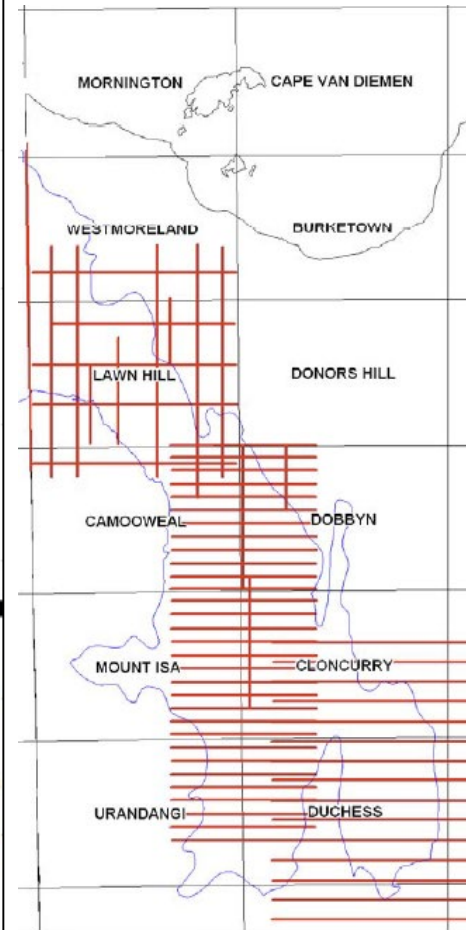


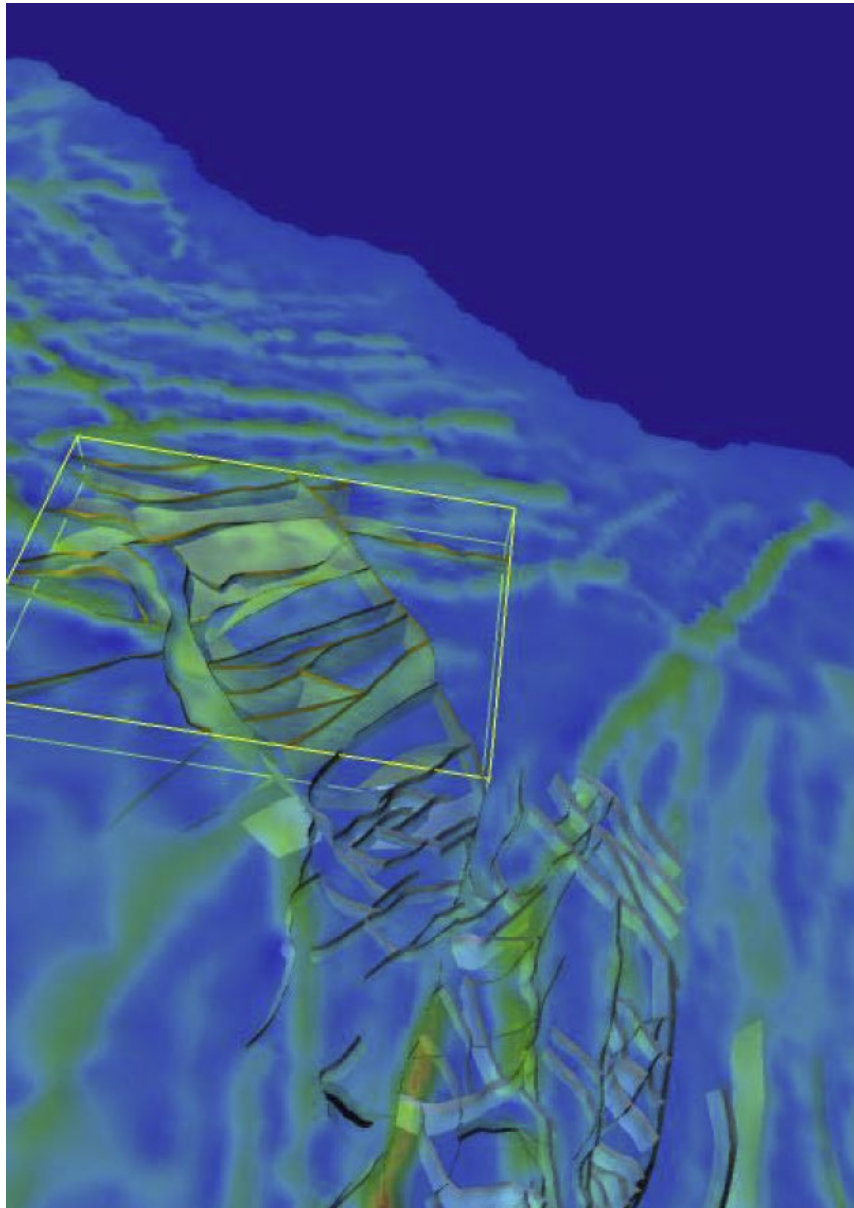
- Isa-McArthur Project Extent
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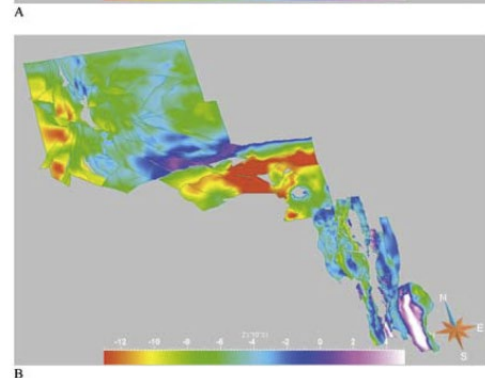
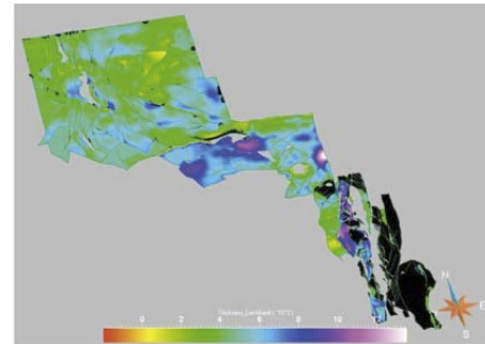


- Isa-McArthur Project Extent
- adopted Superbasin packaging in NWQ
 - >> 100K Solid Geology re-interp
- significant use of WORMS (Mag & Grav)
- variable Section spacing & orientation
 - >> 10km WFB; 16km EFB; *var* LHP

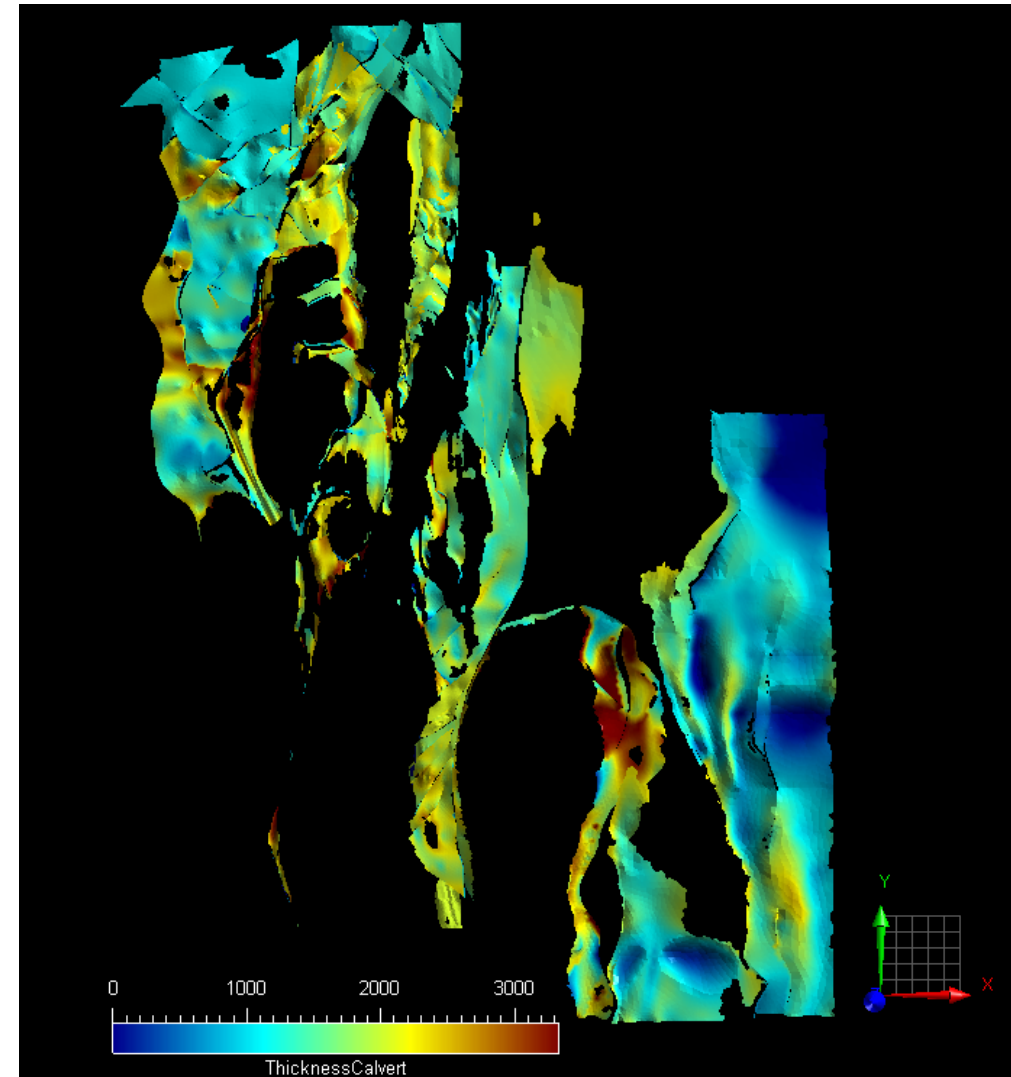
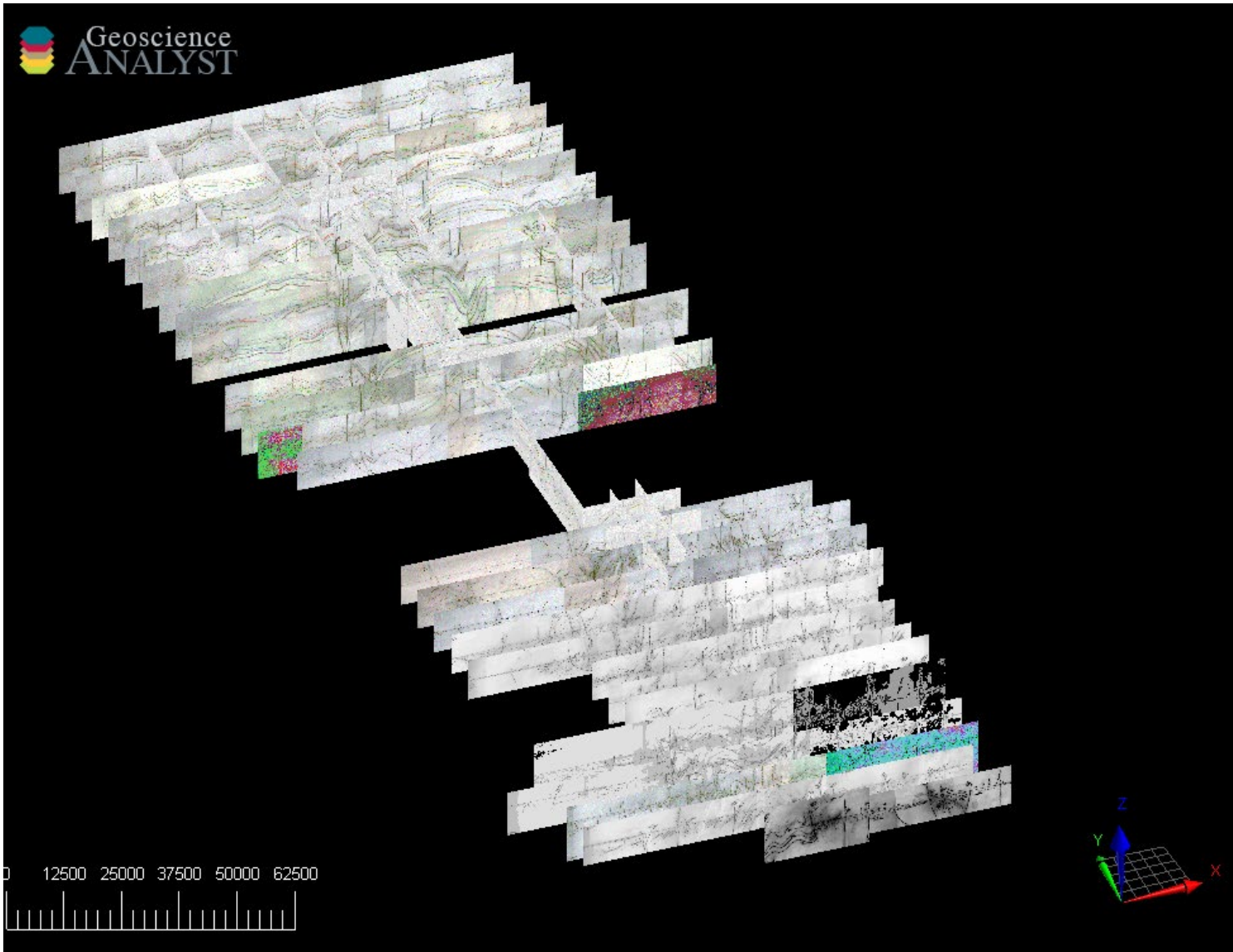




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- variable Section spacing & orientation
 - >> 10km WFB; 16km EFB; *var* LHP
- **refined structural-supersequence 3D Model**
 - >> Superbasin isopachs & depths-to-base
 - >> significantly refined 100K 3D Model (NWQ)



17 Sections and Isopachs



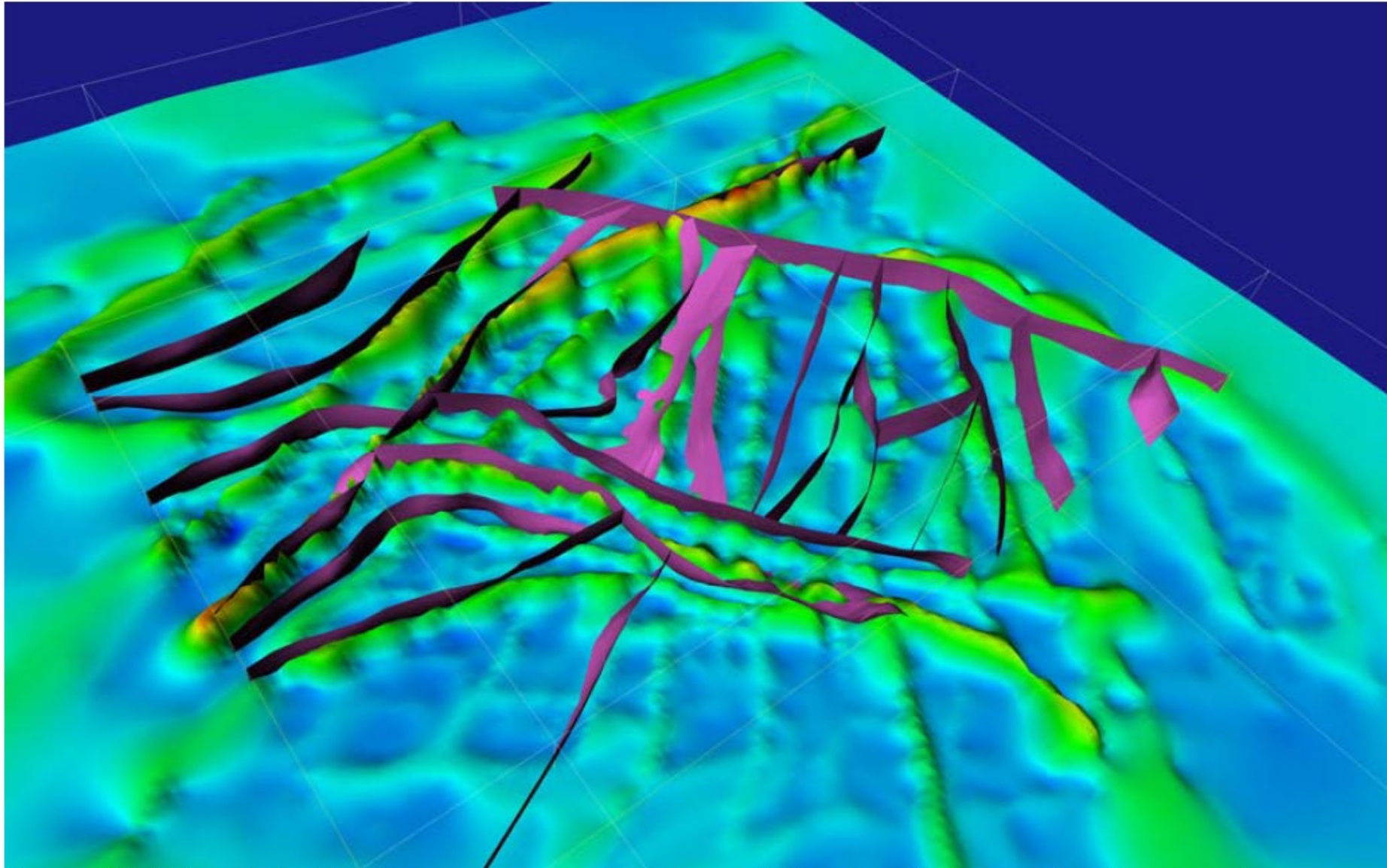
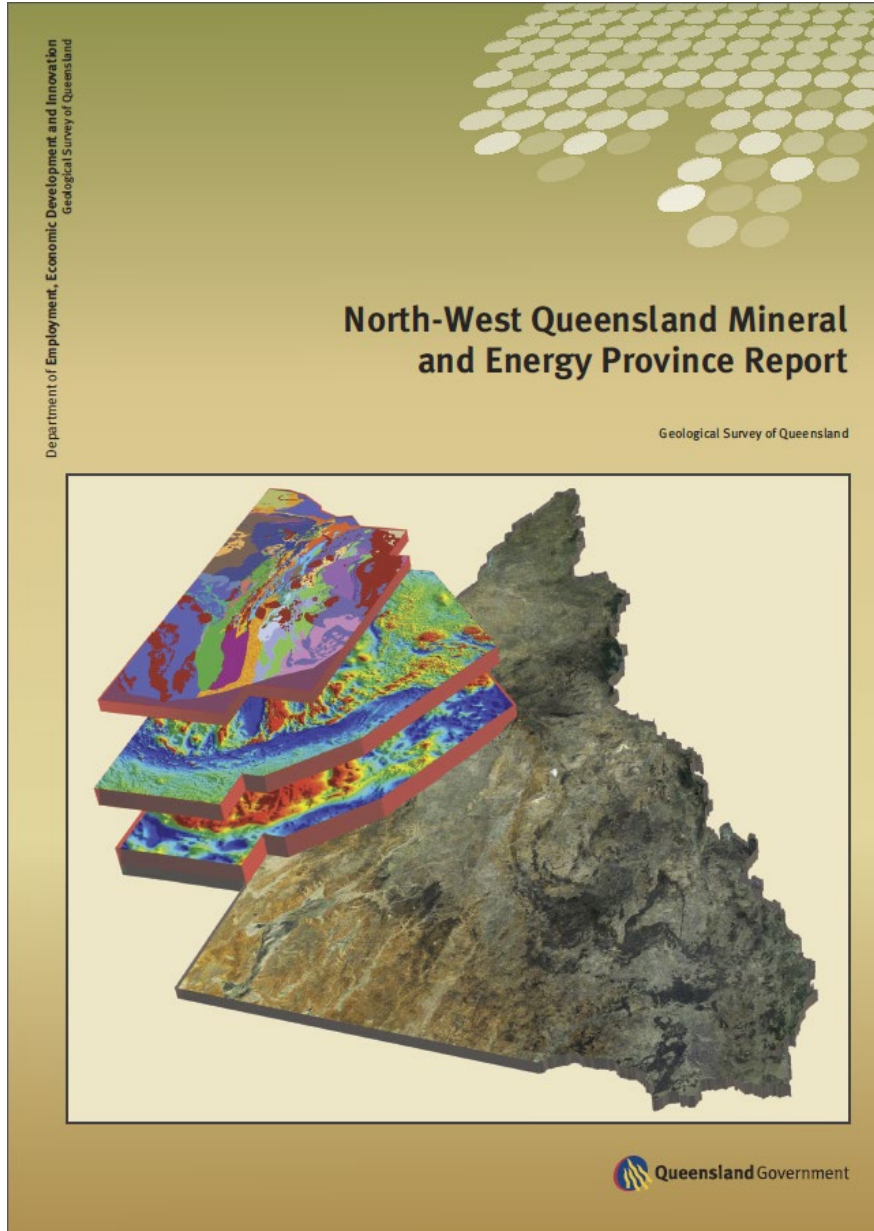
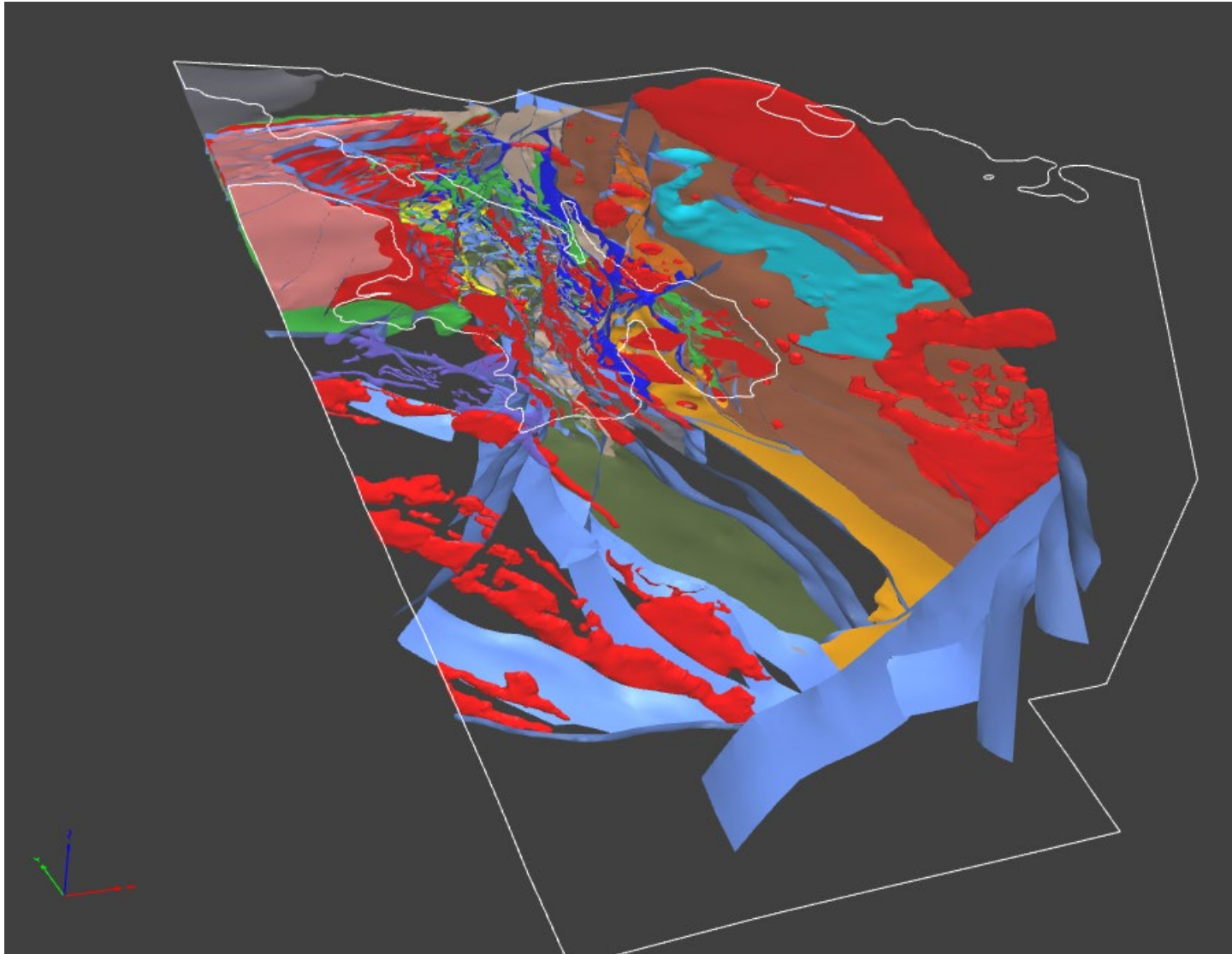
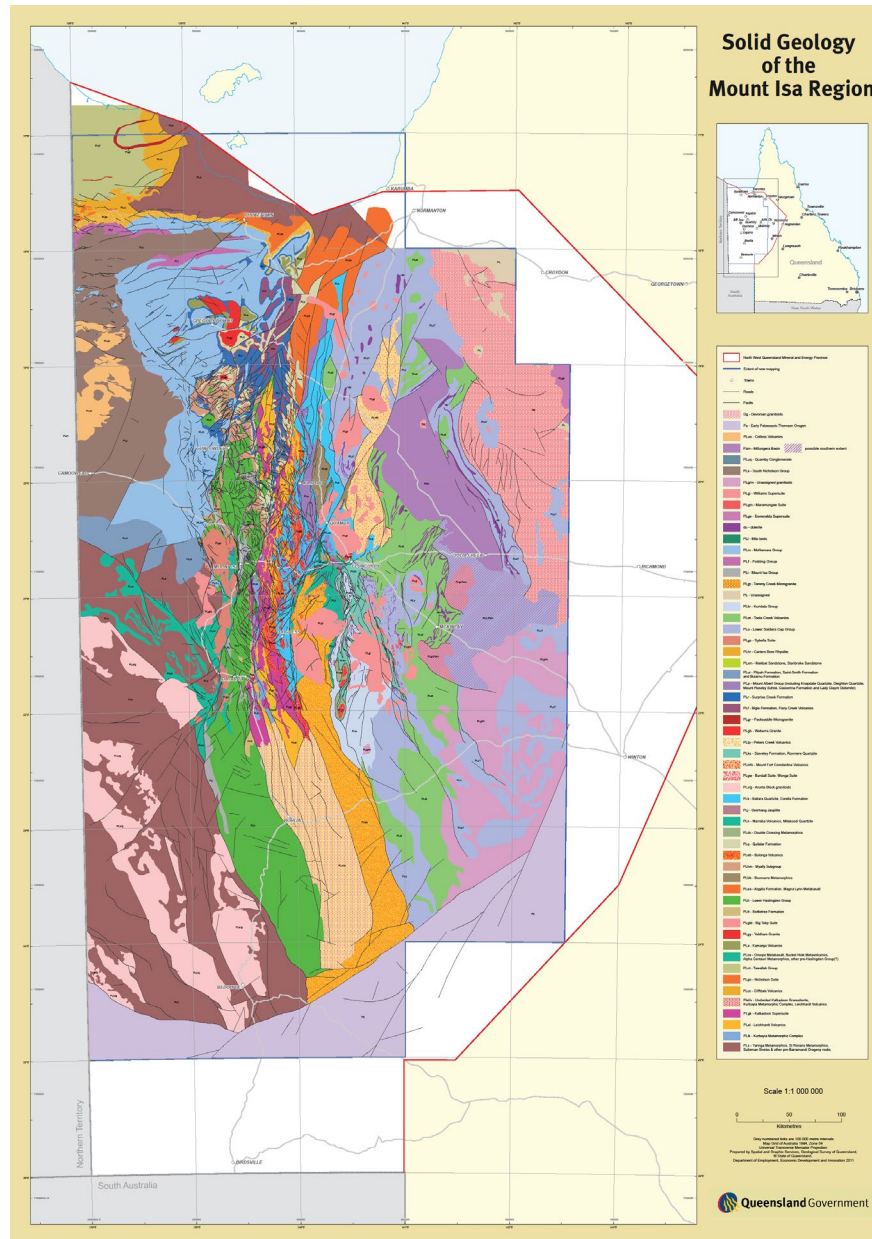


Figure 23: 3D modelled faults superimposed on magnetic line length image, view from west.

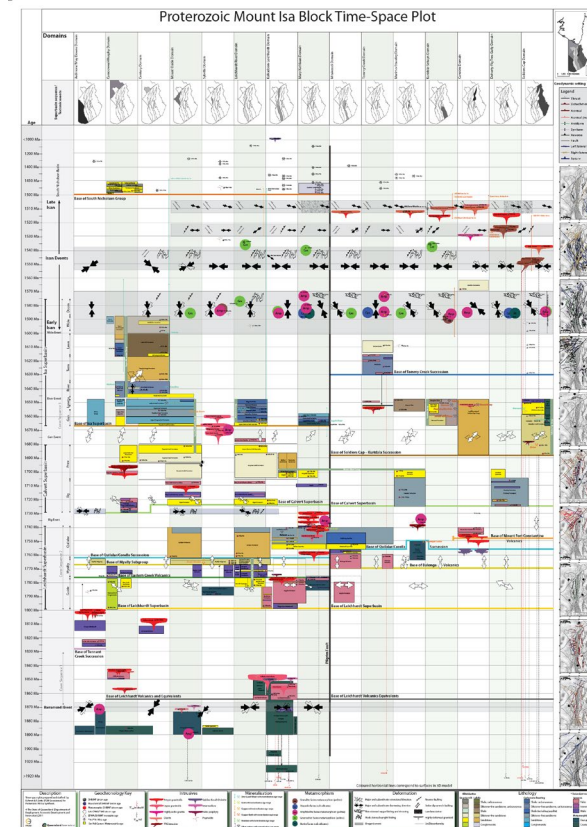


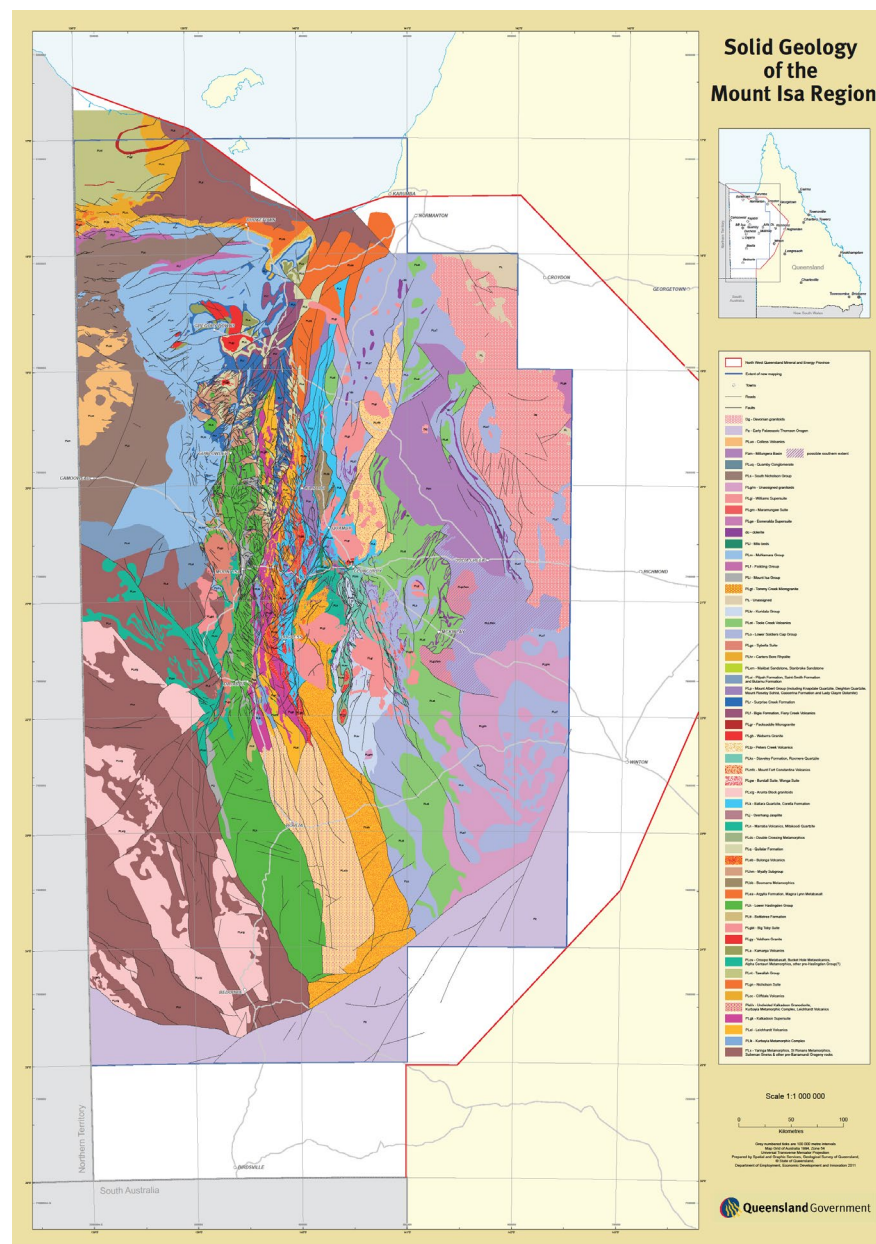


•Reg 3D (1:2m scale)

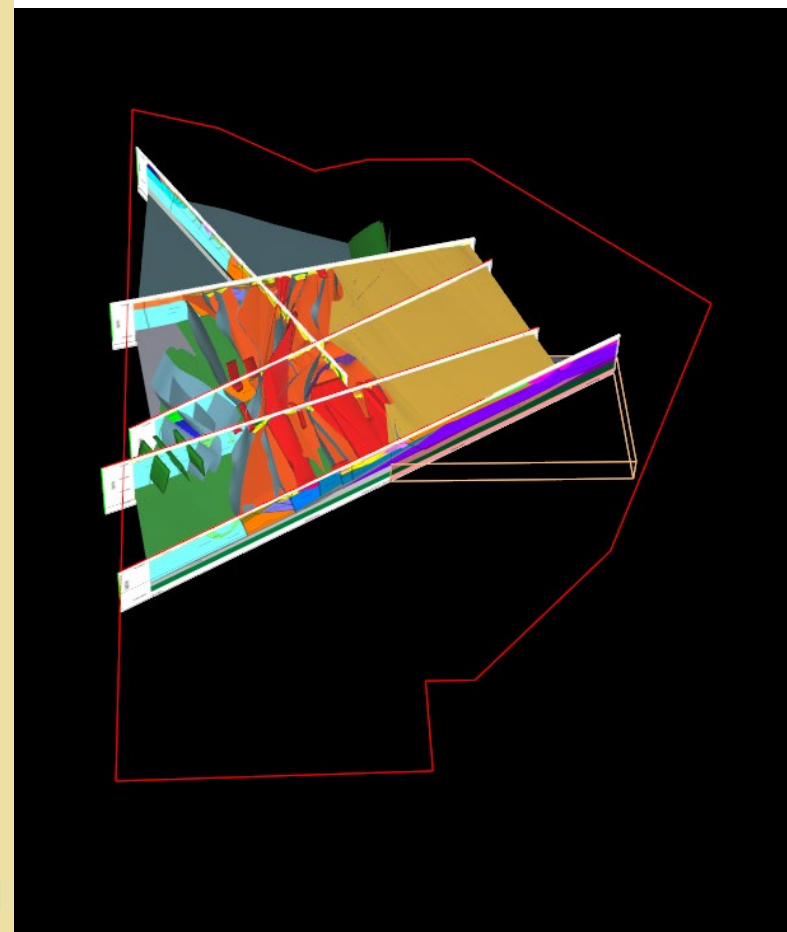


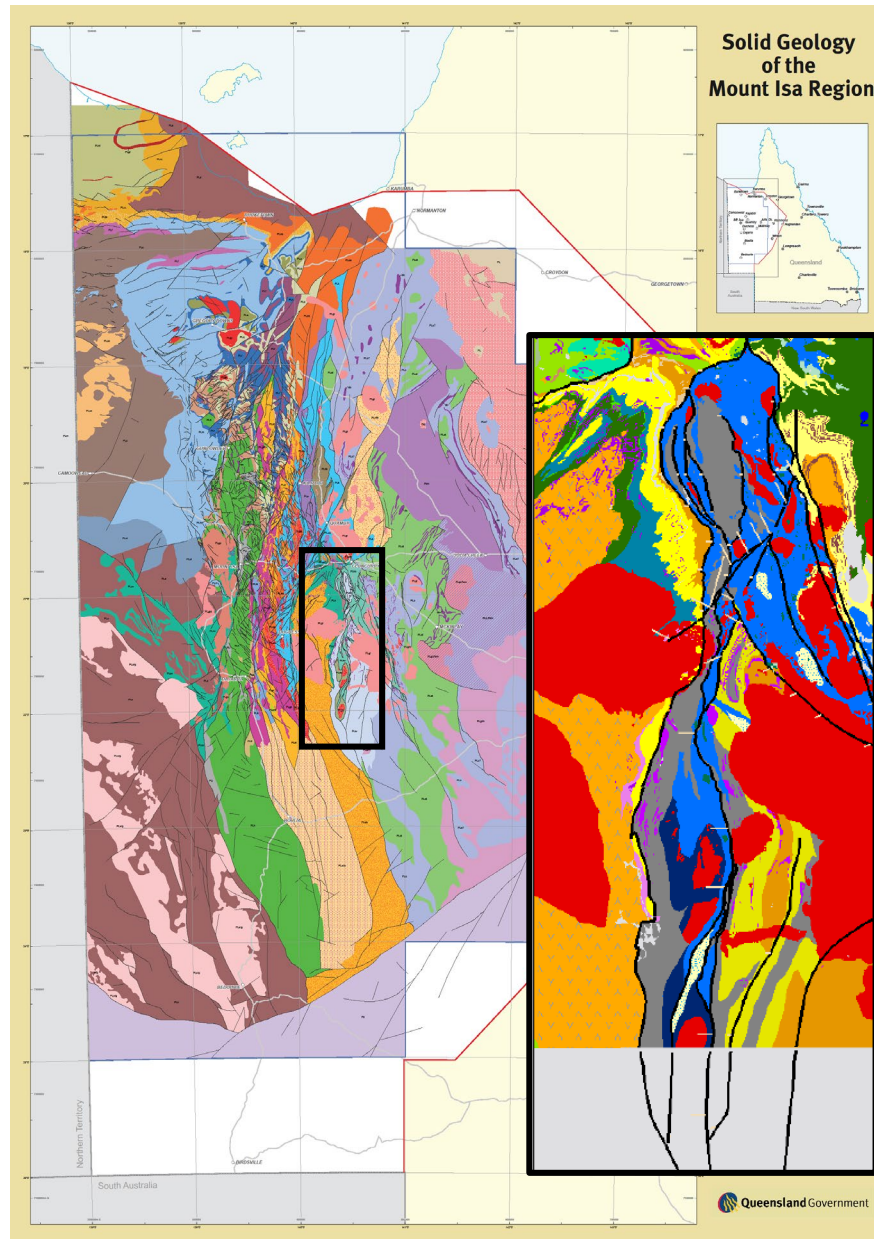
- re-work 250K Solid Geology
- >> NABRE Superbasin Successions
- revised Time-Space compilation



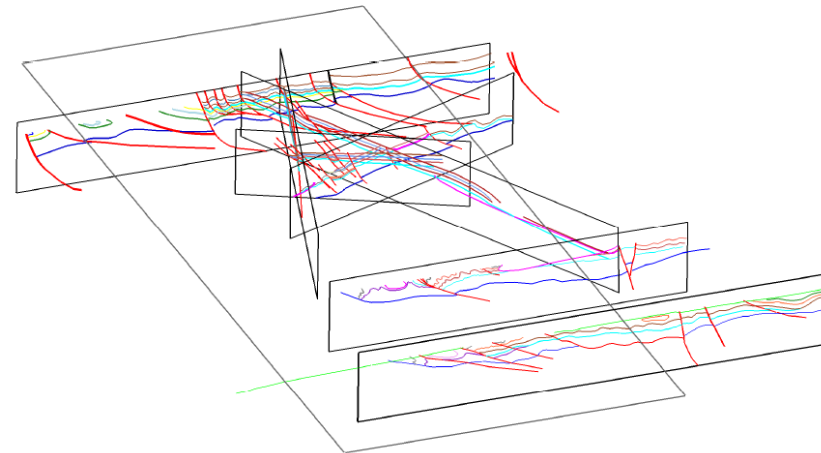


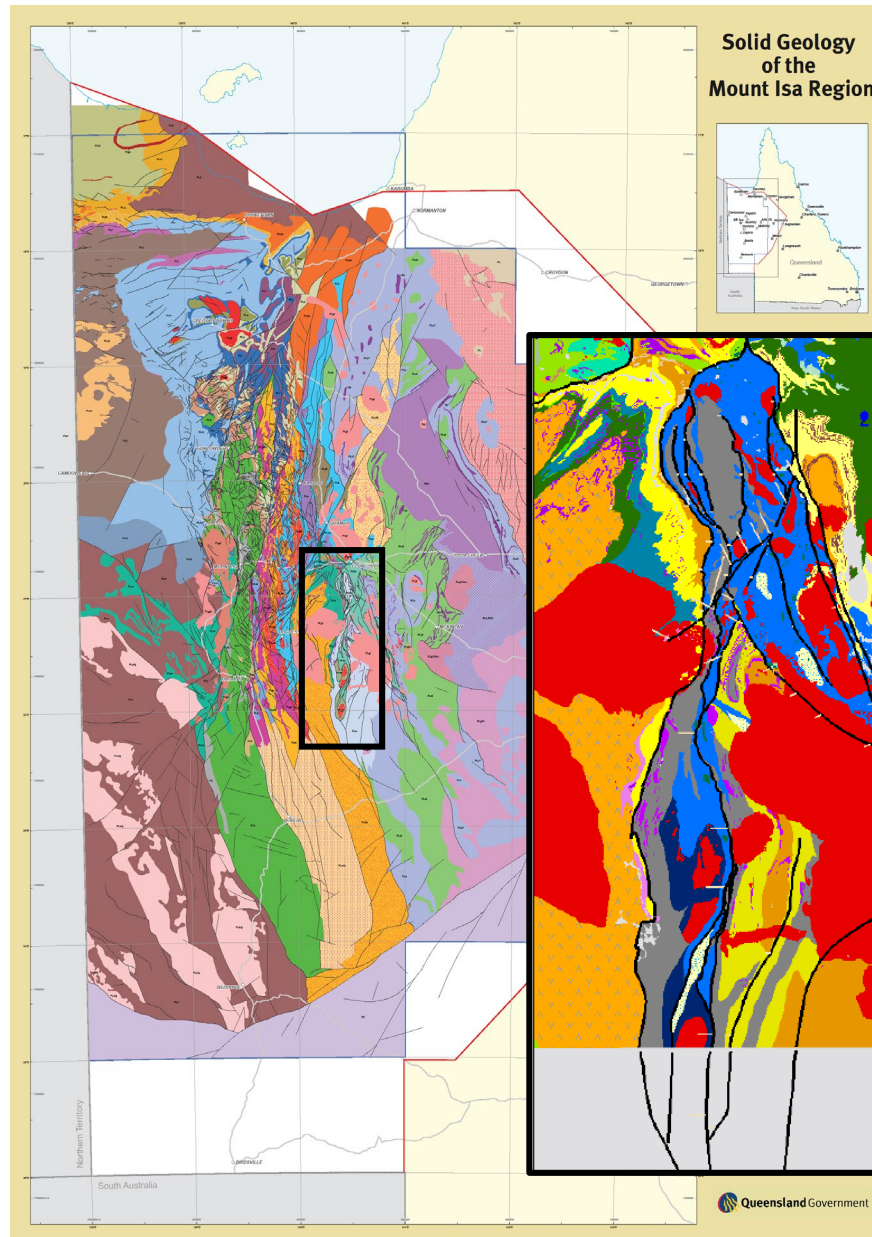
- re-work 250K Solid Geology
 - >> NABRE Superbasin Successions
- revised Time-Space compilation
- **VERY broad scale Sectional Interps**
 - >> crude 3D Model connecting seismic sections



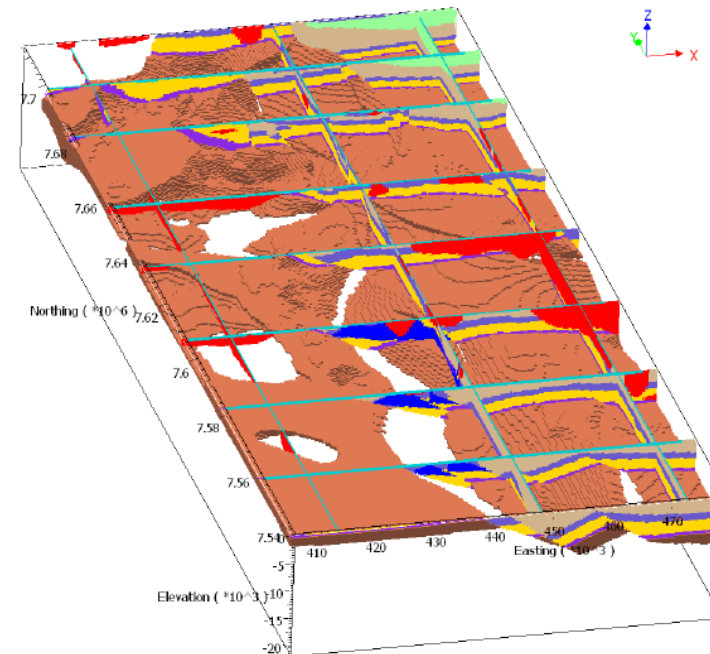


- re-work 250K Solid Geology into
 - >> NABRE Superbasin Successions
- revised Time-Space compilation
- VERY broad scale Sectional Interps
 - >> crude 3D Model
- Incorporated EFB MIRA 3D Modelling
 - 100K Solid Geology Interpretation
 - Regional Seismic Sectional Interpretations
 - >> deep crustal interpretations





- re-work 250K Solid Geology into
 - >> NABRE Superbasin Successions
- revised Time-Space compilation
- VERY broad scale Sectional Interps
 - >> crude 3D Model
- Incorporated **EFB MIRA 3D Modelling**
 - 100K Solid Geology Interpretation
 - Regional Seismic Sectional Interpretations
 - >> deep crustal interpretations
 - >> refined local (EFB) 3D Model



Geophysical modelling and 3D mineral potential mapping for Iron Oxide Copper Gold mineralisation over the Mount Dore region, Queensland

Queensland Geological Survey

August 2010



ADVANCED GEOPHYSICAL INTERPRETATION CENTRE
www.mirageoscience.com
info@mirageoscience.com

Chapter 5

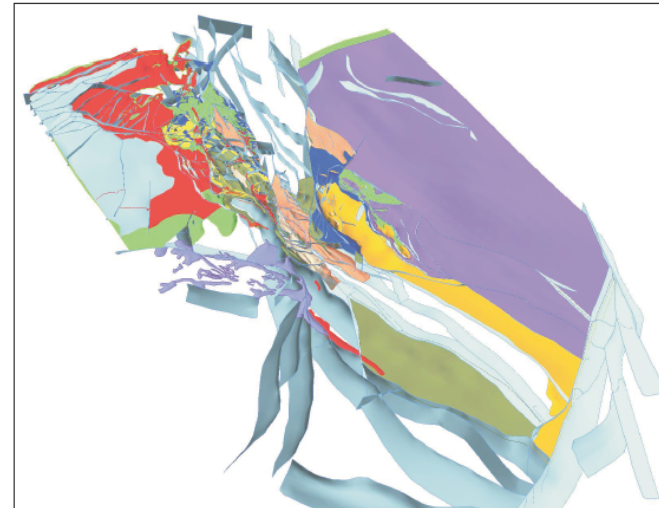
3D Architecture

North-West Queensland 3D architecture

The NWQMEP Study 3D model (Figure 5.1) is a conceptual synthesis of the current state of geological knowledge and understanding of the crustal architecture, basin evolution, deformation, fluid flow and mineralising processes of this region.

The model covers an area of over 500 000km² and builds on a number of earlier products including the *pmd**CRC 11, 12, 14 and 17 3D models (Murphy & others, 2007). This new model is based on new GSQ geological mapping and seismic and magnetotelluric datasets not available to the *pmd**CRC, and stands as a completely new product with only surfaces from the Lawn Hill and Mount Oxide areas remaining largely unchanged. The new model also expands the coverage of the earlier model by over 70% to include those areas of the Mount Isa Inlier concealed by younger cover sequences. The 3D product also includes a separate coarser-scale regional model showing geophysically modelled regions of the deep crust to provide an appreciation of whole-of-crust processes affecting the project area.

A significant enhancement of the model in covered parts of the terrane is the addition of a surface representing depth to Proterozoic basement (DtB) below the topographic surface. It is anticipated that this surface will be of considerable benefit to explorers for target selection, targeting and resource evaluation.



3D Architecture

Chapter 5

Leichhardt Domain. Large thickness variations are observed within the ISB with the greatest apparent thicknesses observed within the modelled section of the Century Domain (>4km). Within most of the region the base of the LSB is modelled as relatively shallow with the deepest levels occurring within the central part of the Century Domain (~18km depth), although this shallows greatly within the Kamarga Dome.

A large scale nappe-type structure has been modelled in the Eastern Fold Belt representing the Mitakoodi Culmination, however no other nappe type structures have been recognised.

Significant magmatic belts have been modelled within the region, and are essential to the framework of the Mount Isa Inlier. Intrusives modelled include the Kalkadoon, Toby–Ewan, Wonga, Weberra, Sybella and Williams Suites. These intrusives have been modelled as generally shallow massive flat based bodies.

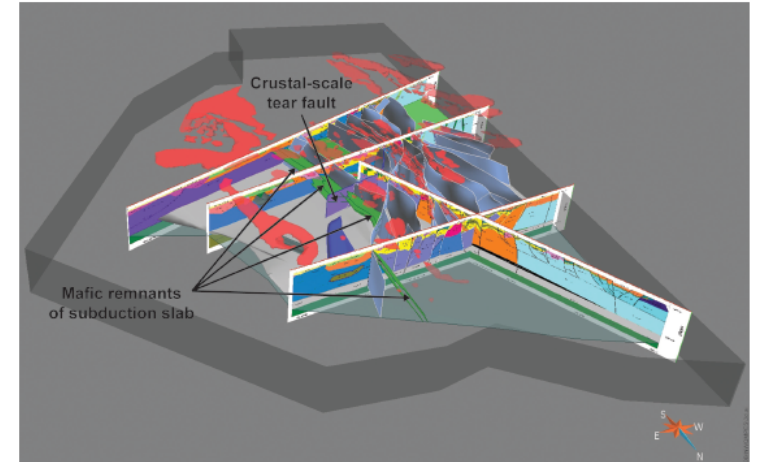
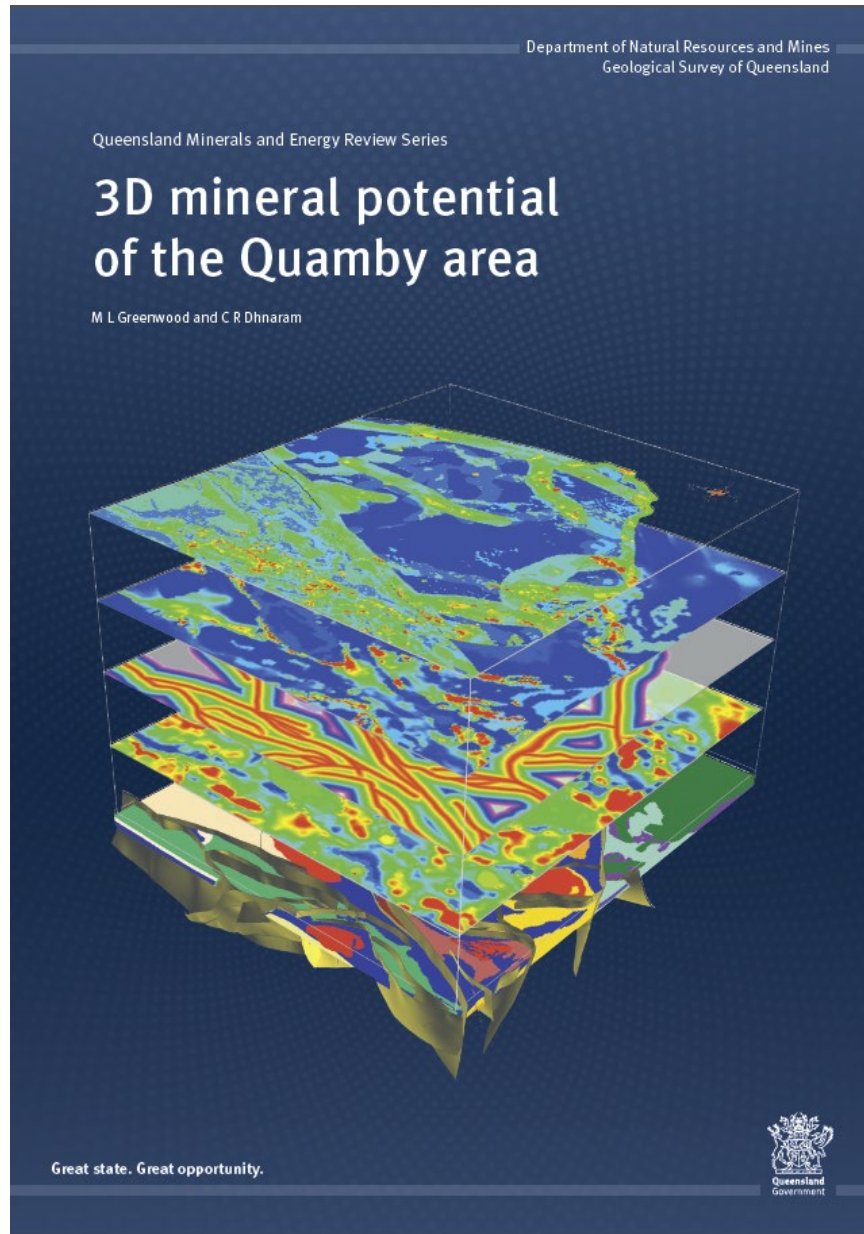
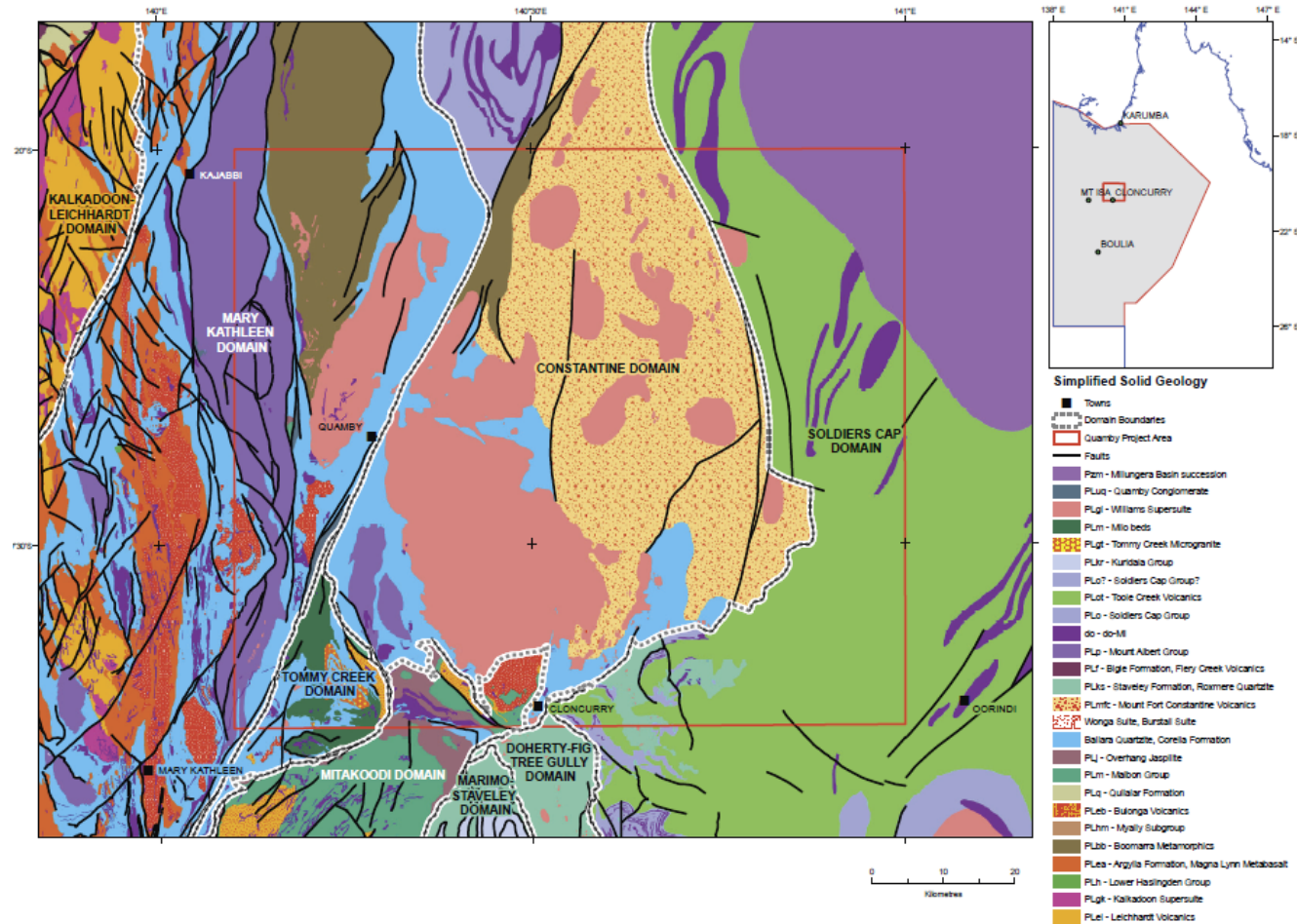


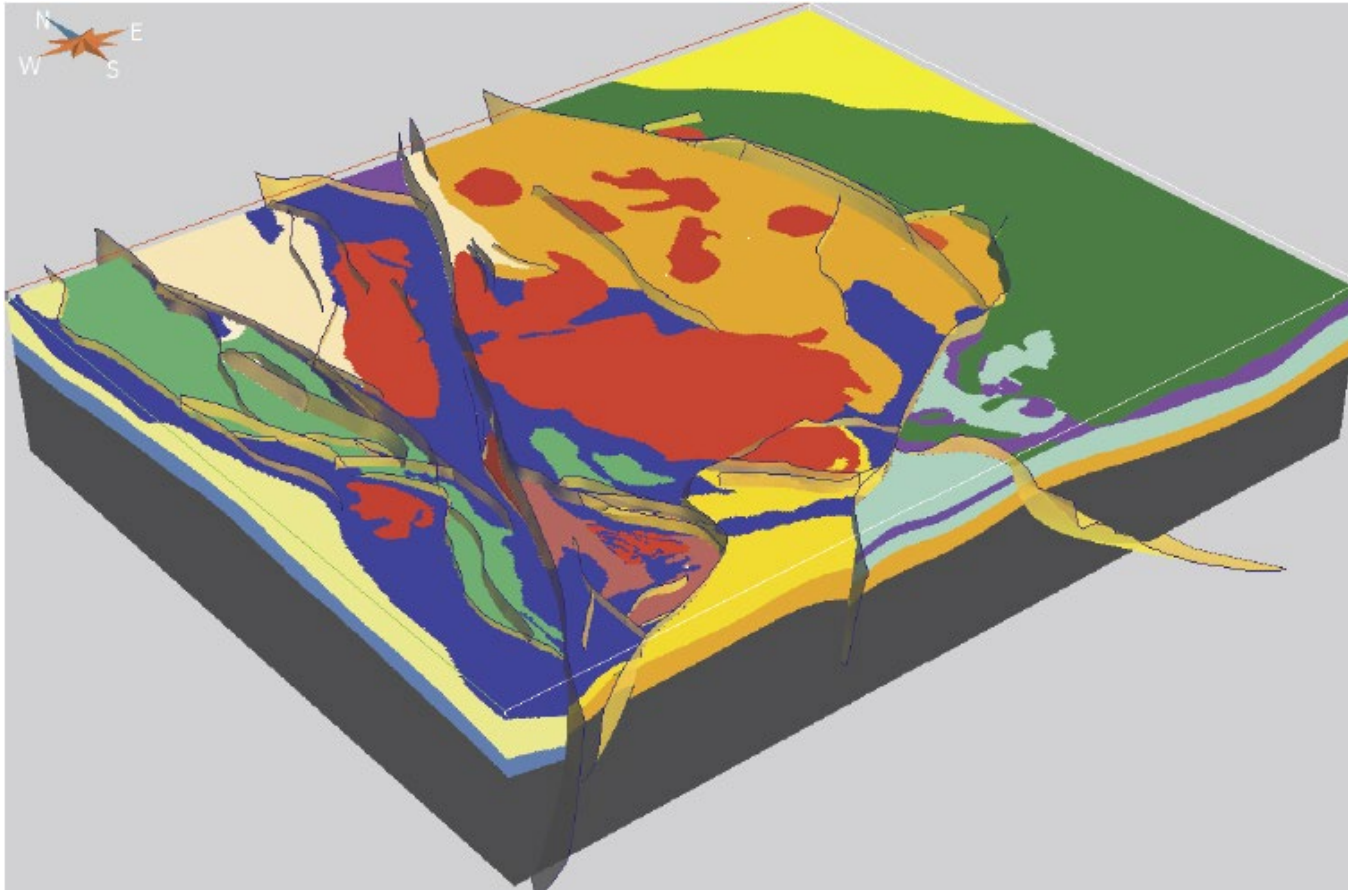
Figure 5.4: Regional 3D model derived from simplified crustal-scale forward modelled sections — proposed mafic slab remnant of ancient west-dipping subduction zone highlighted in green



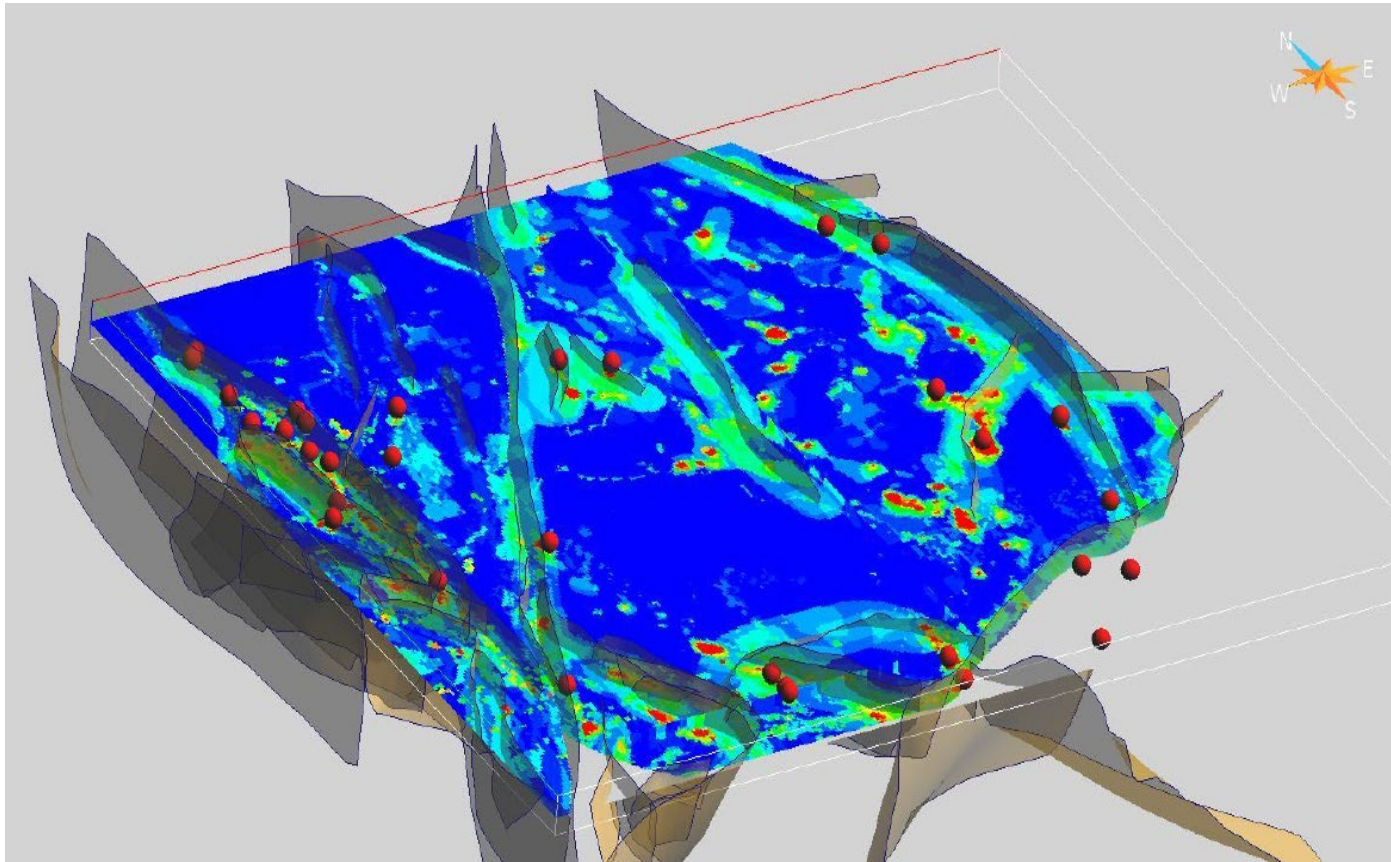
- 100K Solid Geology
- >> lithostratigraphic packaging

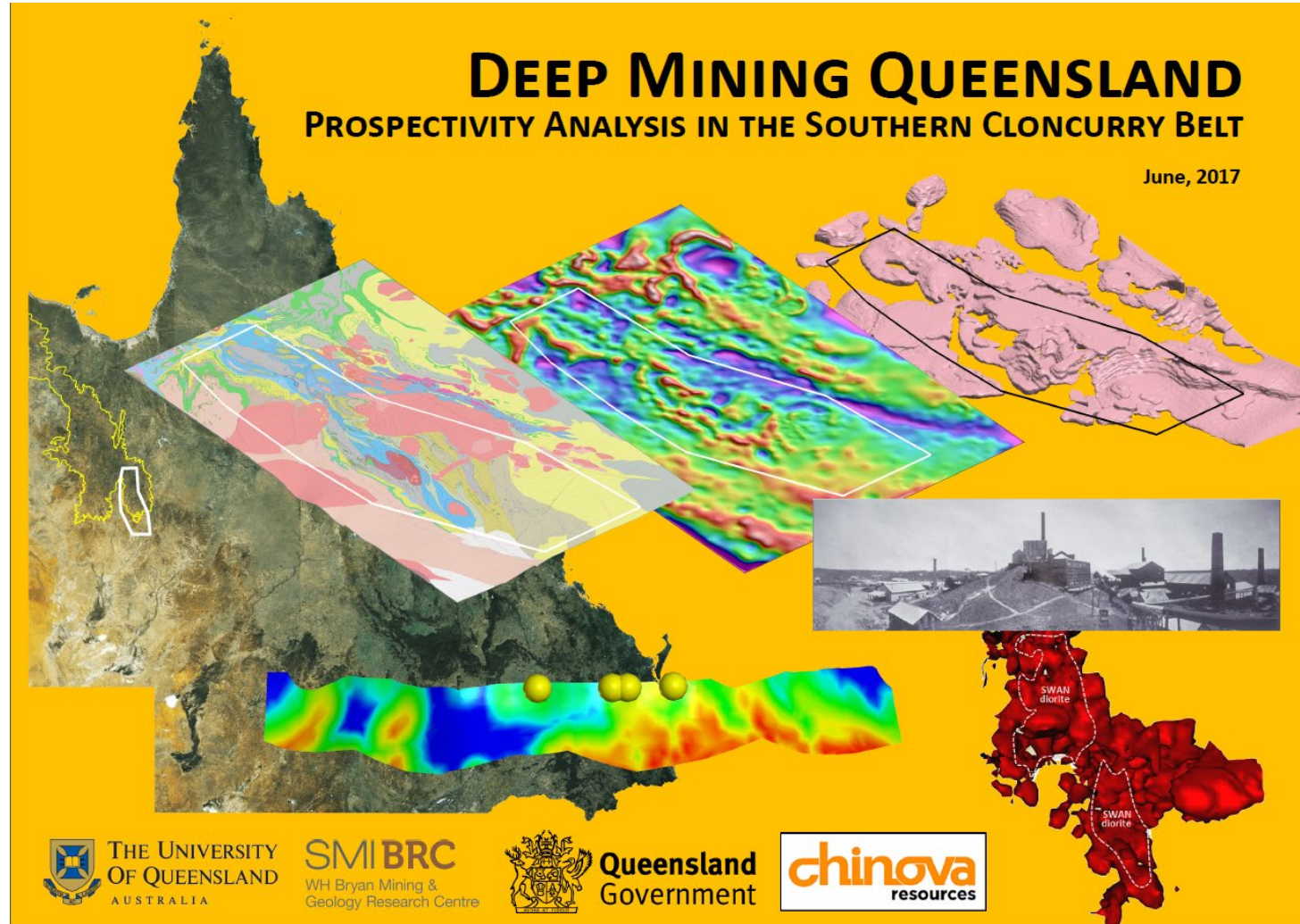


- **100K Solid Geology**
 - >> lithostratigraphic packaging
- **4 sectional Interpretations**
 - >> 3D Model
 - >> refined with geophysical inversion

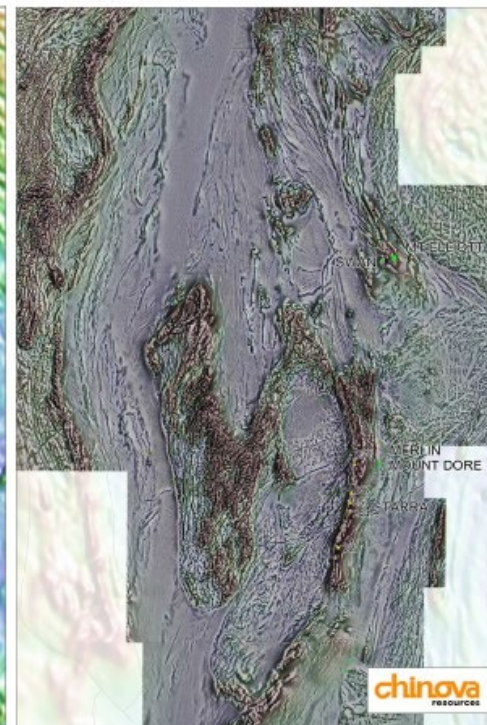
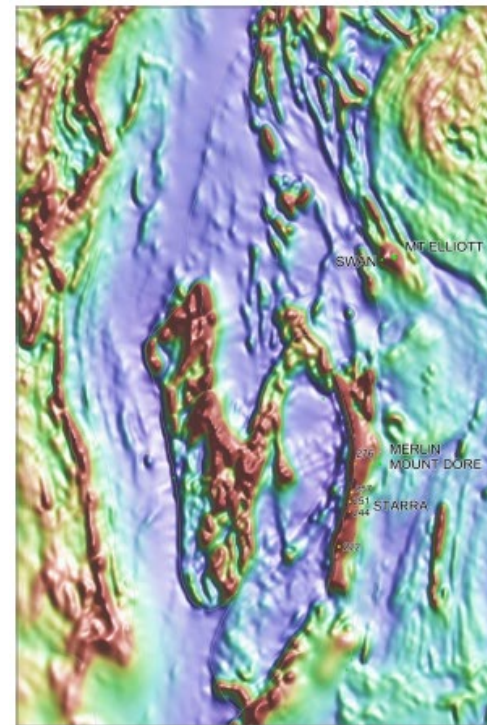
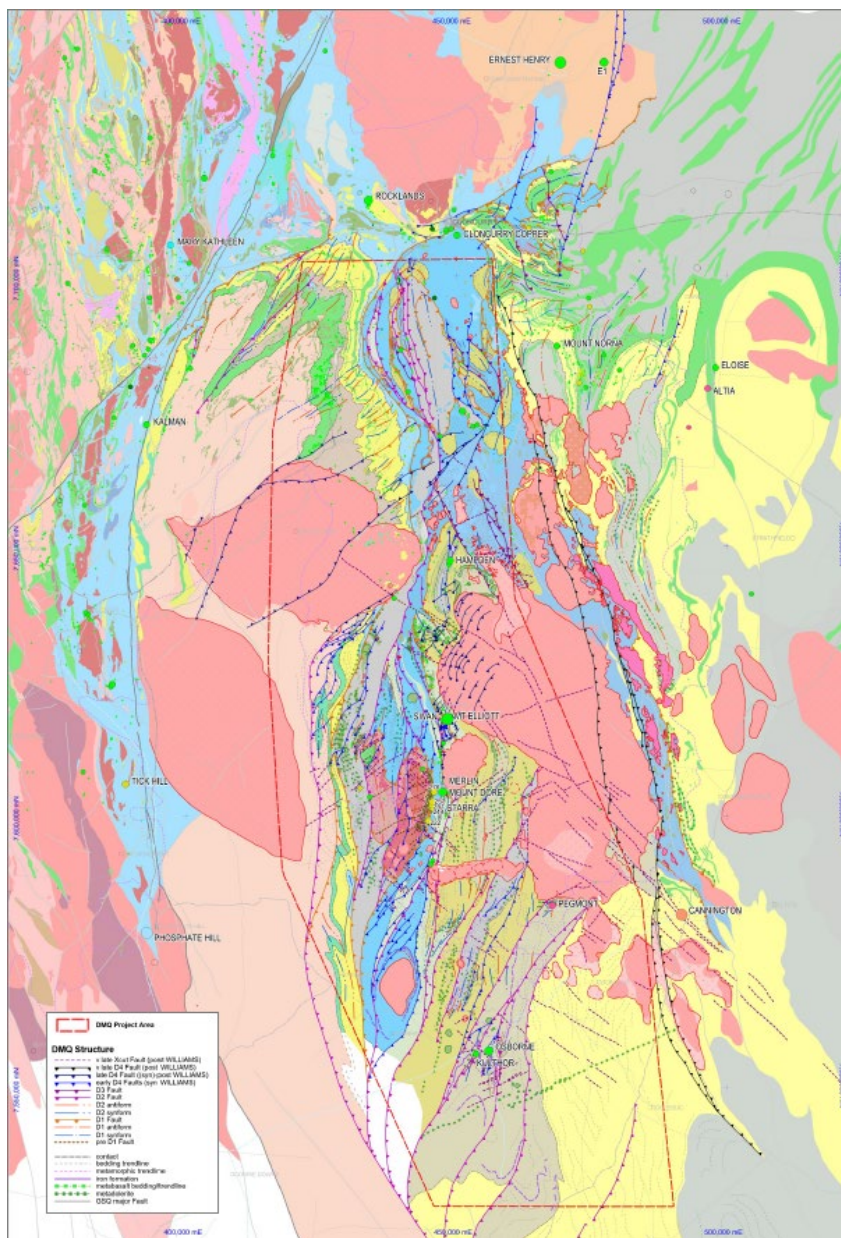


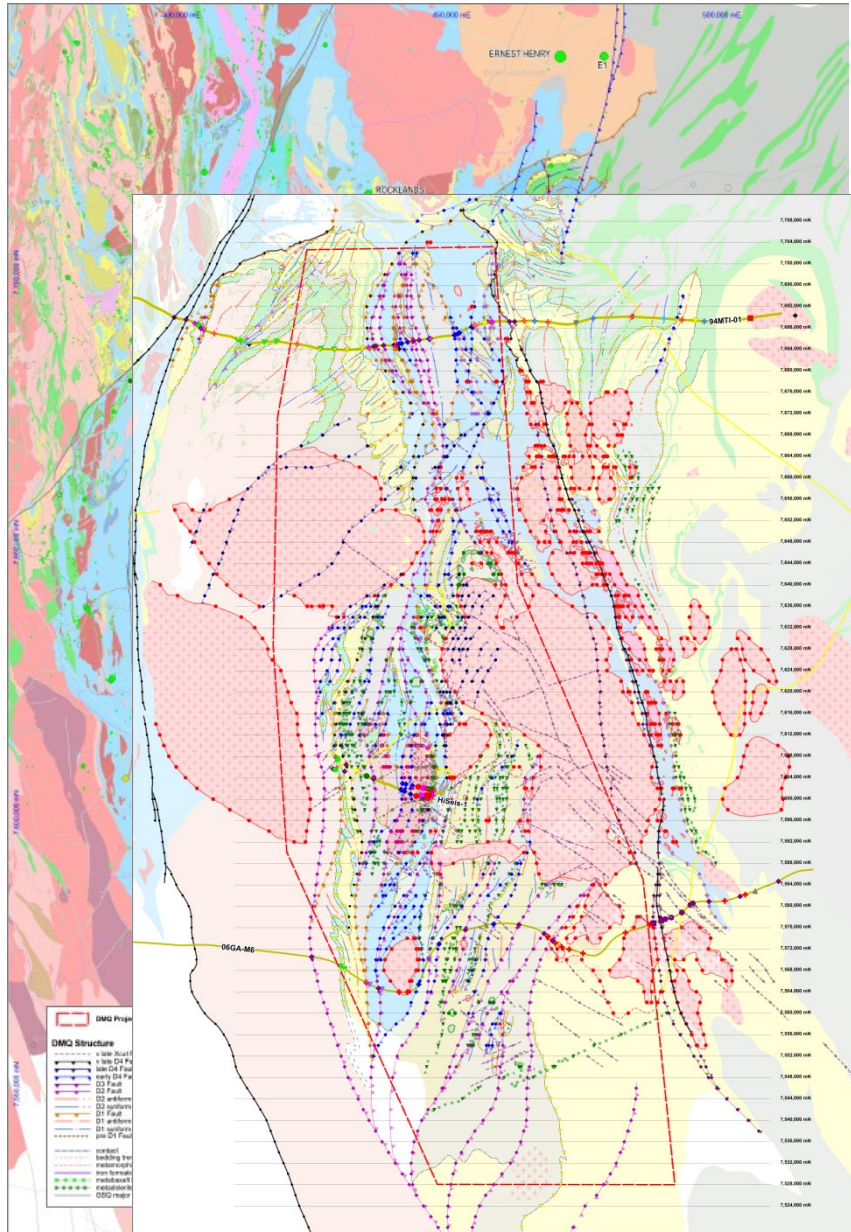
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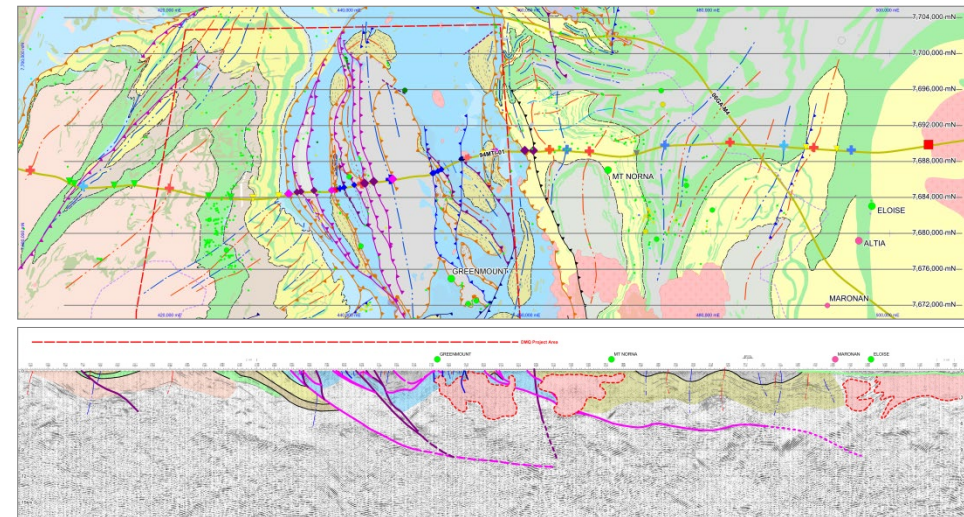


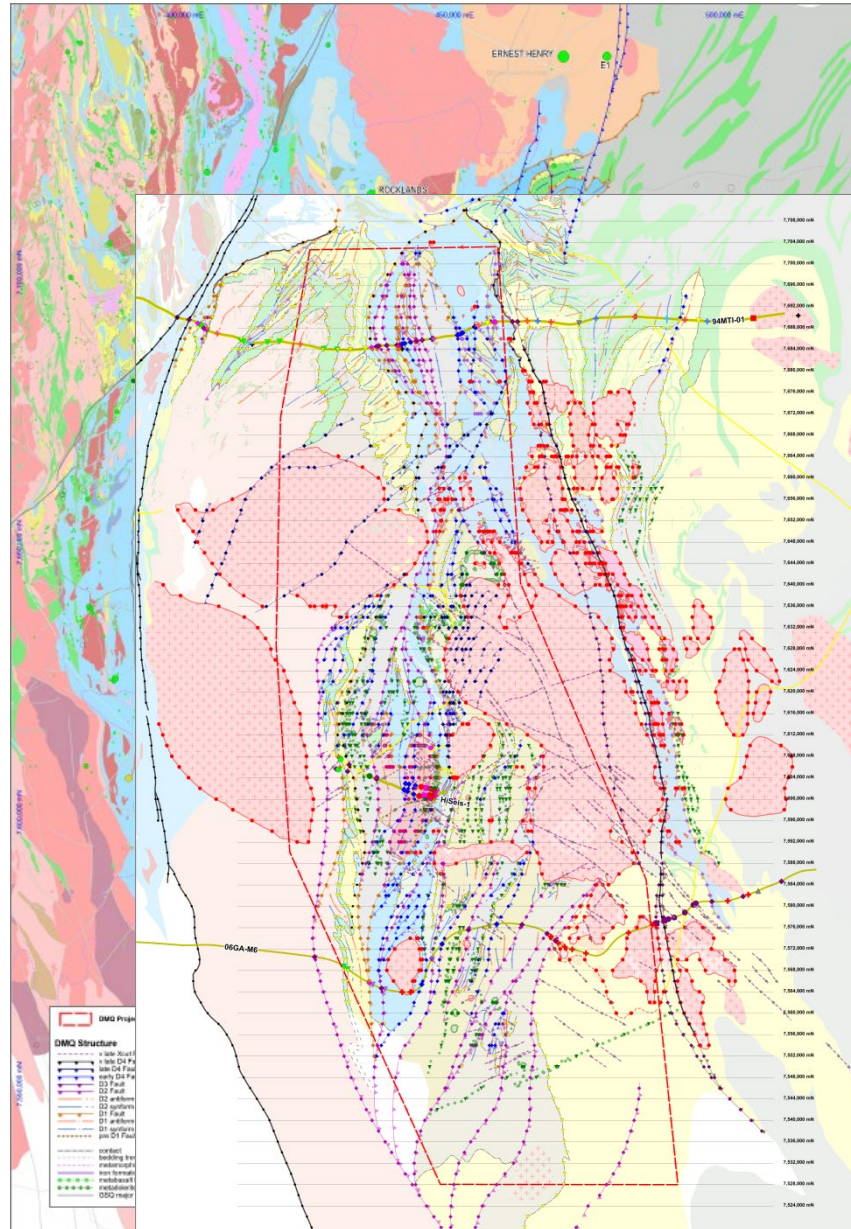
- Eastern Succession ~50K Solid Geology Interp >> DMQ Timeslices
- ~50K Solid Geology leverages *Chinova* hiRes Magnetics & Radiometrics (60m x 100m line spacing)



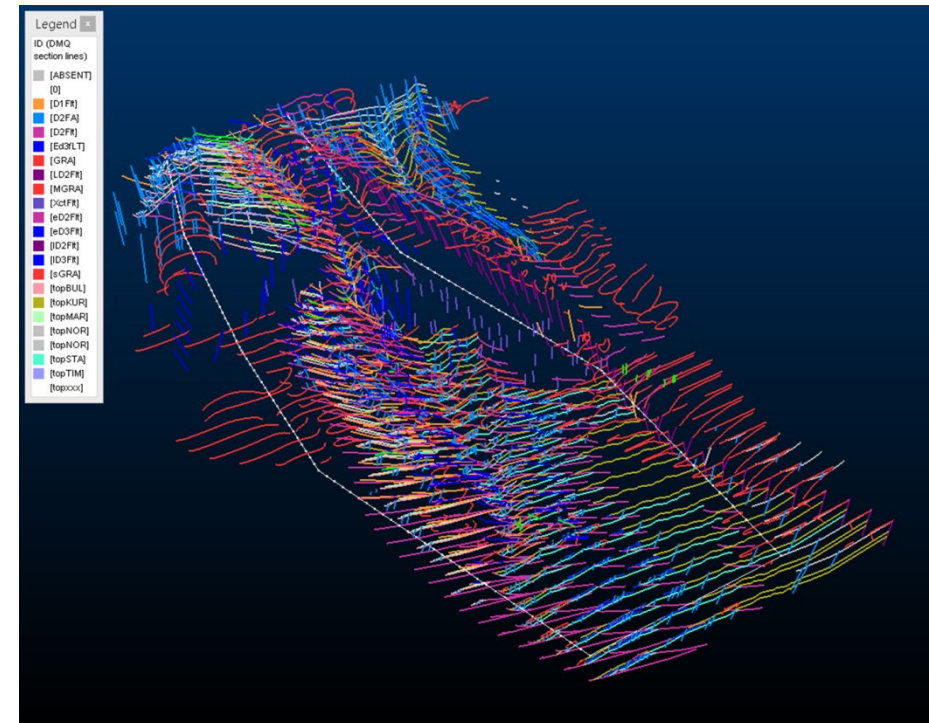


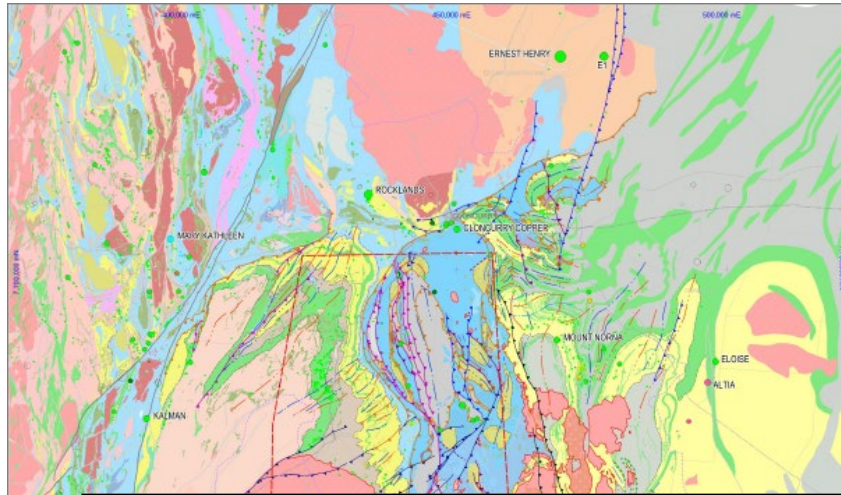
- Eastern Succession ~50K Solid Geology Interp >> DMQ Timeslices
- ~50K Solid Geology leverages *Chinova* hiRes Magnetics & Radiometrics (60m x 100m line spacing)
- **Shallow-focused Seismic re-Interp (6-9km)**
- **Forty-seven 4km-spaced Section Interps**



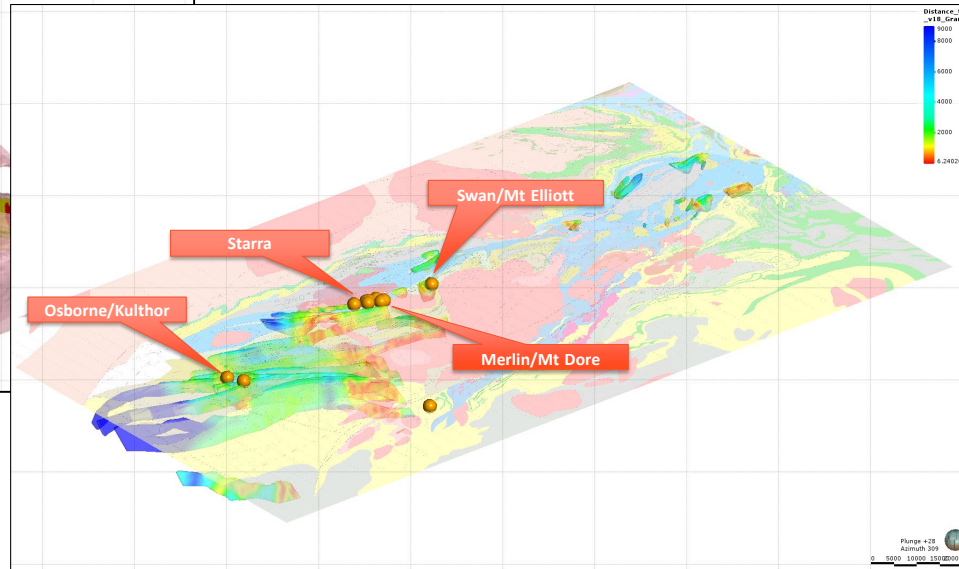
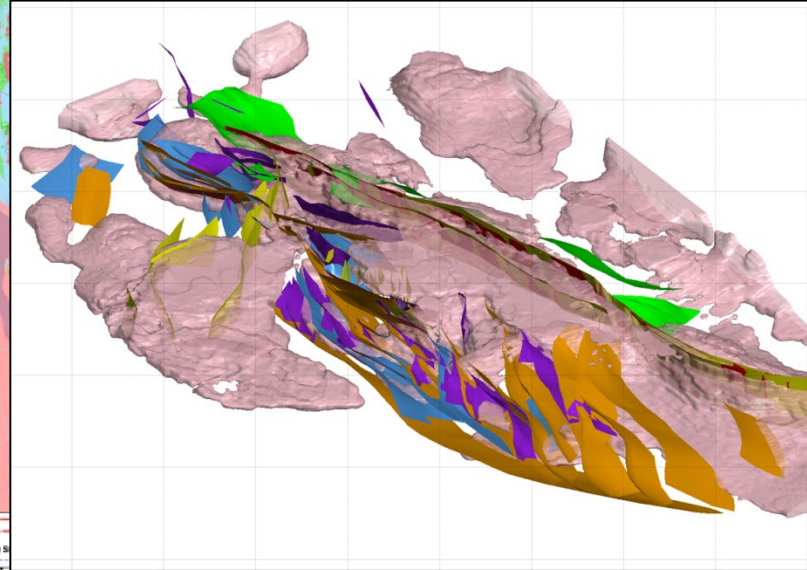


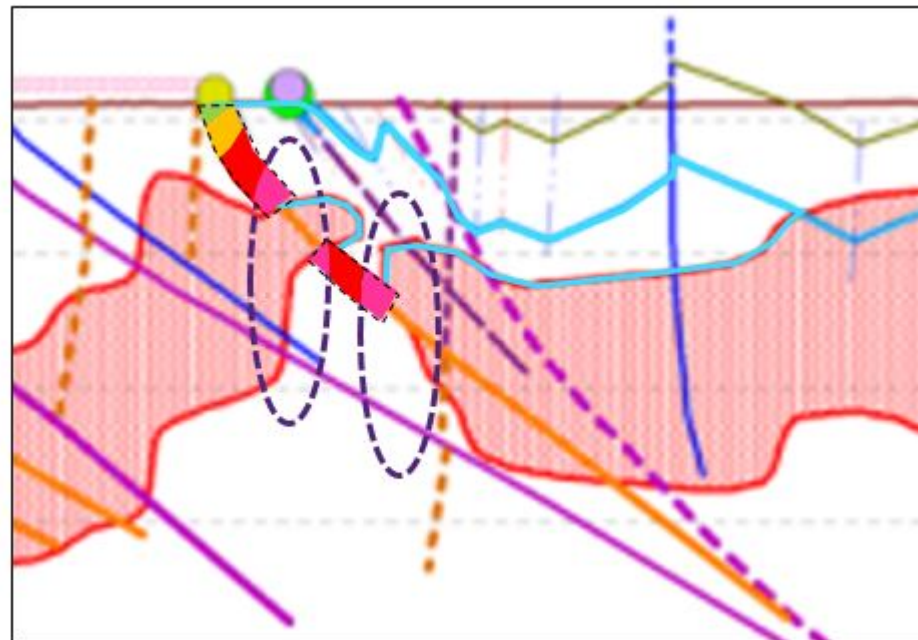
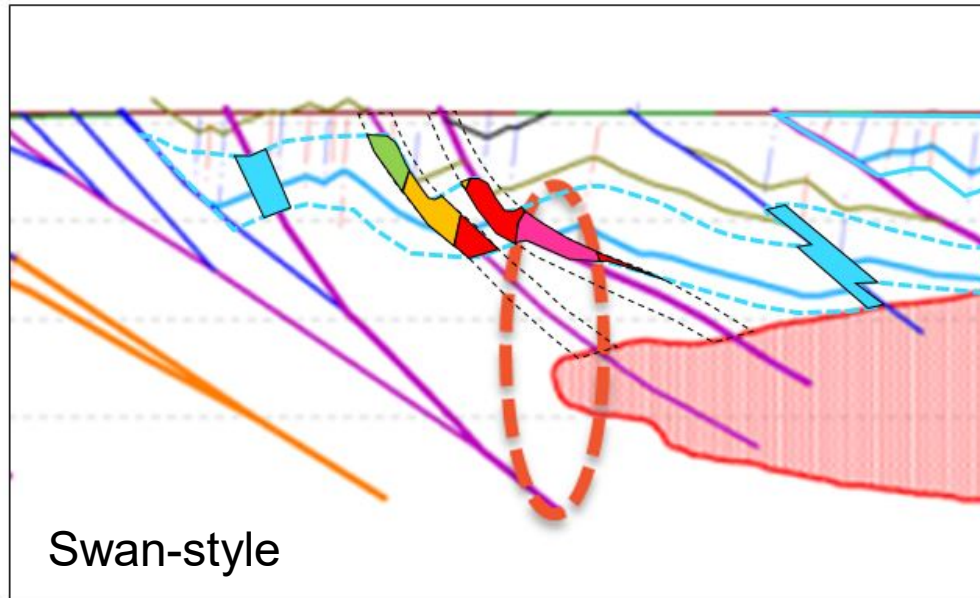
- Eastern Succession ~50K Solid Geology Interp
>> DMQ Timeslices
- ~50K Solid Geology leverages *Chinova* hiRes Magnetics & Radiometrics (60m x 100m line spacing)
- **Forty-seven 4km-spaced Section Interps**
>> **Shallow-focused Seismic re-Interp** (6-9km)
>> **Shallow-focused Serial Section Interps**
>> **Robust 3D geometries in exploreable volume to ~2km**



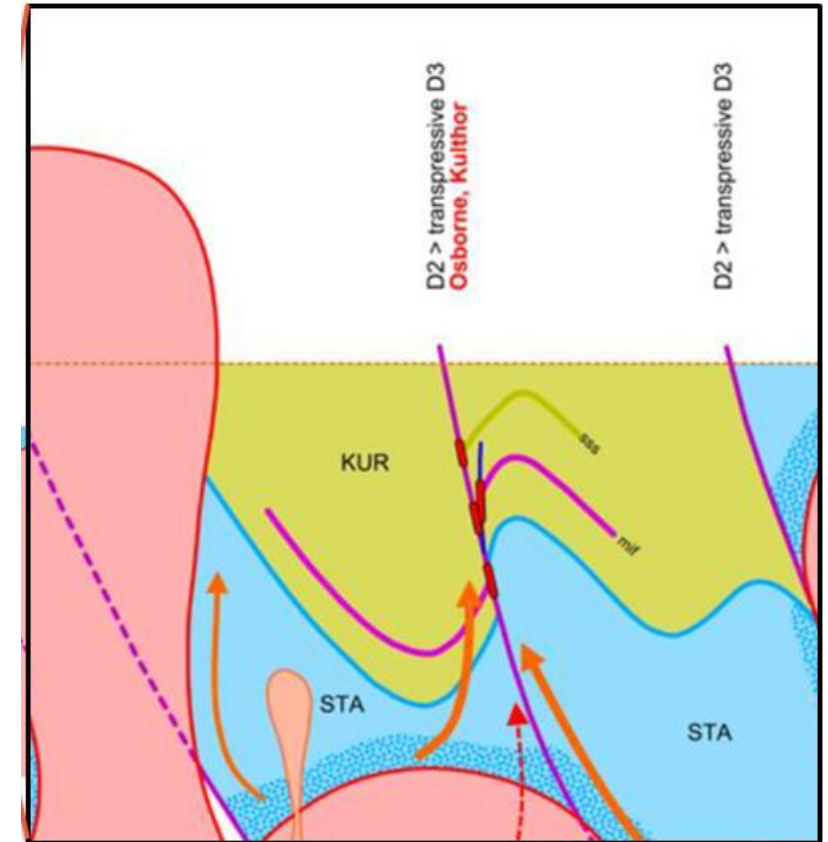


- Eastern Succession ~50K Solid Geology Interp
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 - >> **Shallow-focused Serial Section Interps**
 - >> **Robust 3D geometries in exploreable volume to ~2km**
 - >> **Robust Prospectivity Analysis ..**
.. that identifies **Prospective Tracts**





Starra-style



Osborne-style



Thank you

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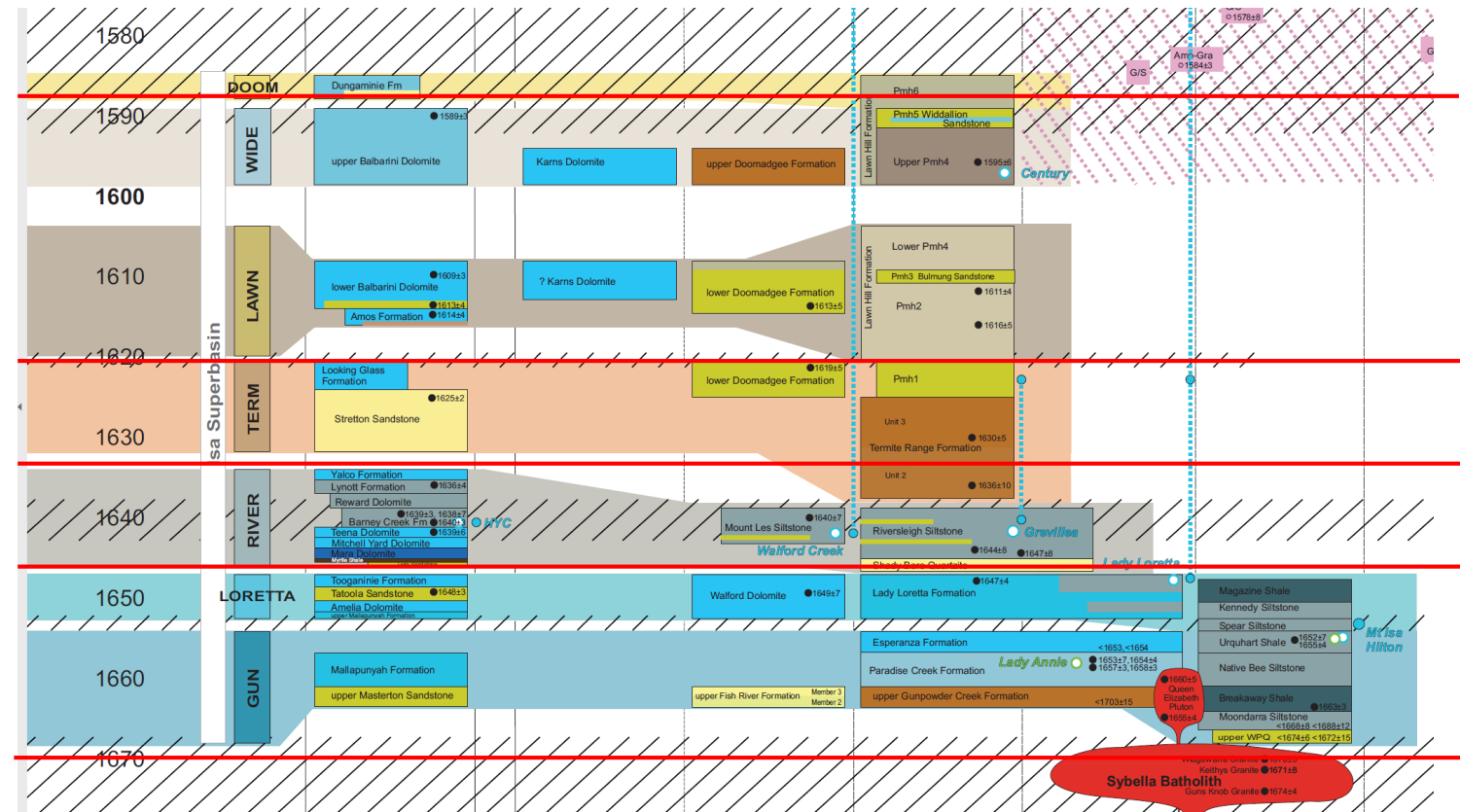
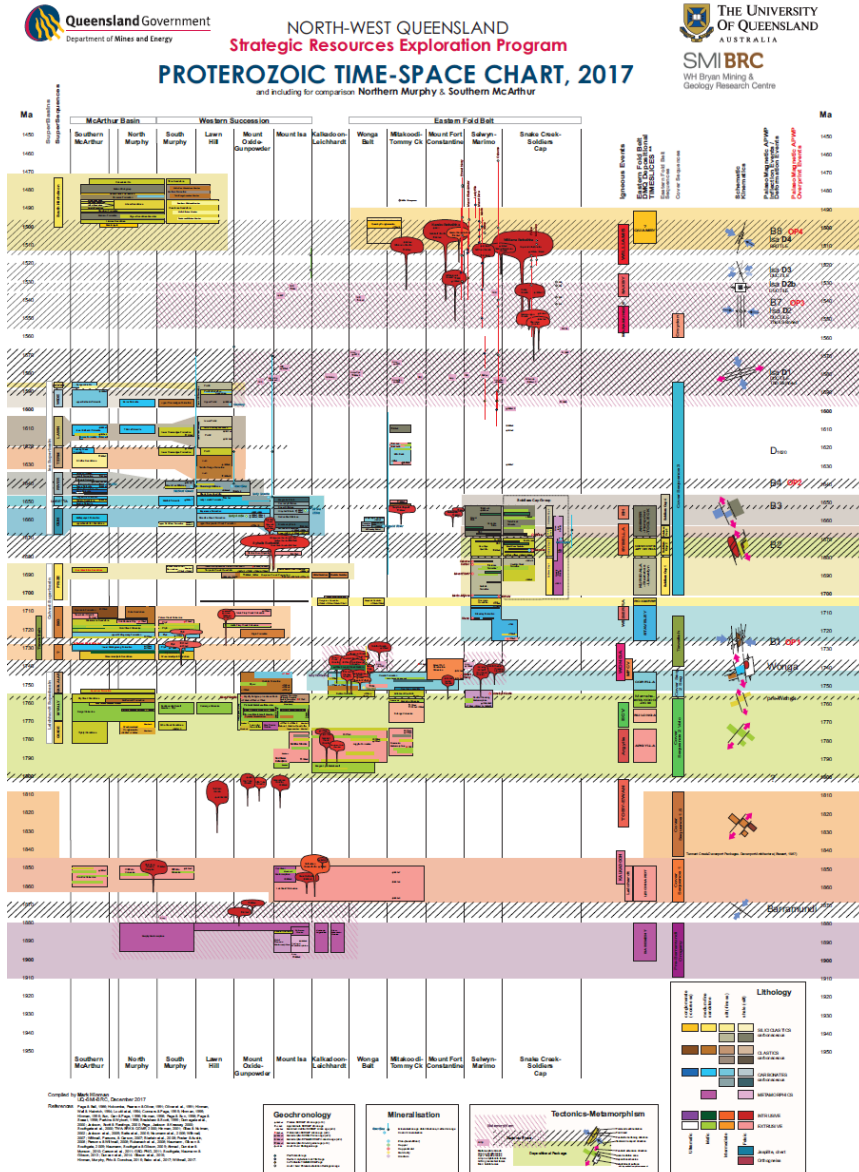
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G14 surfaces modelled



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