



Government of **Western Australia**
Department of **Mines and Petroleum**



EXPLORATION
INCENTIVE SCHEME

Forrest Zone: lithological characteristics and structural evolution






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Eucla stratigraphic drilling results release, September 2015

Geological Survey of
Western Australia



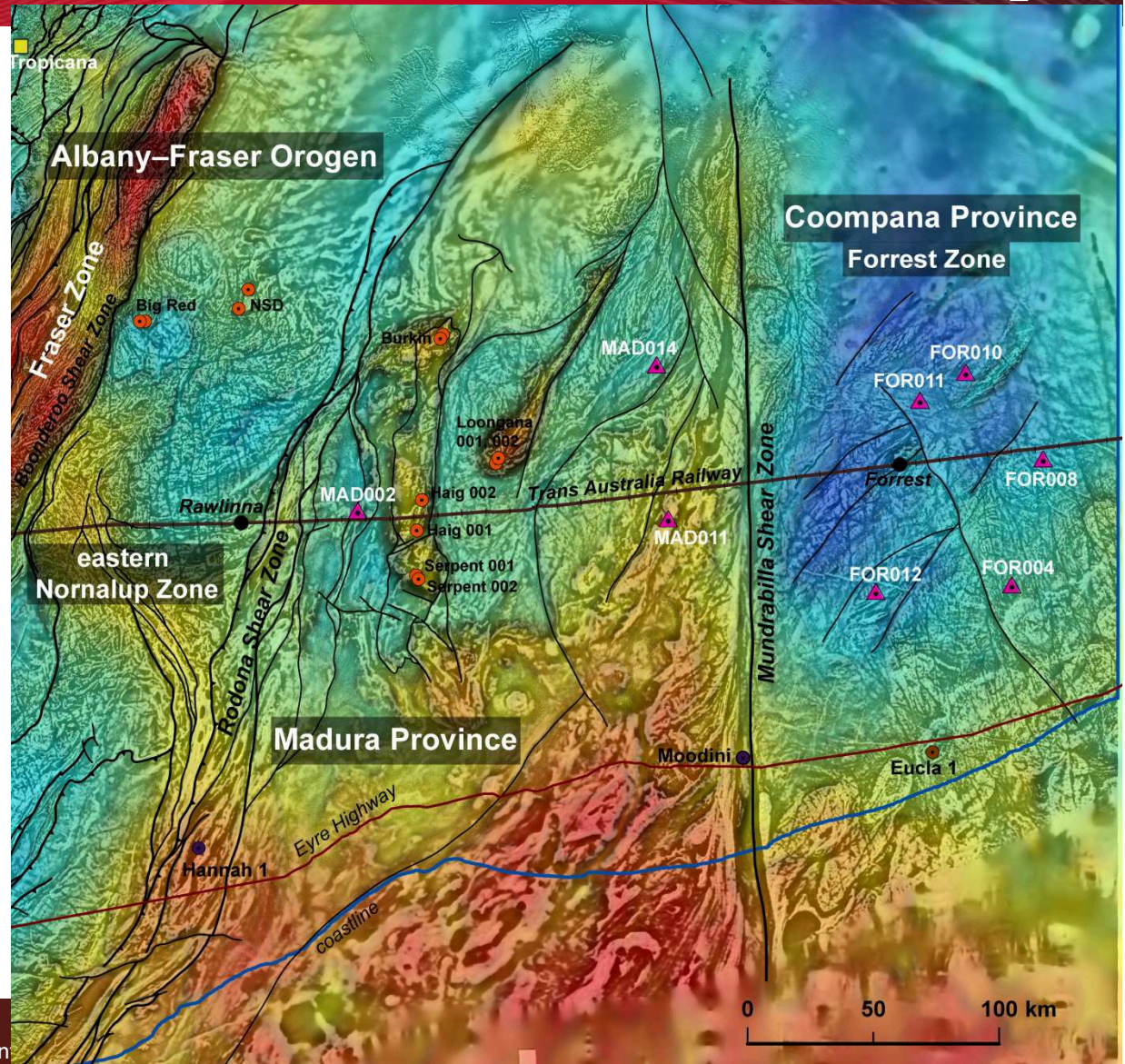
Introduction

-  GSWA stratigraphic drill hole
-  EIS co-funded drill hole
-  Company donated core site

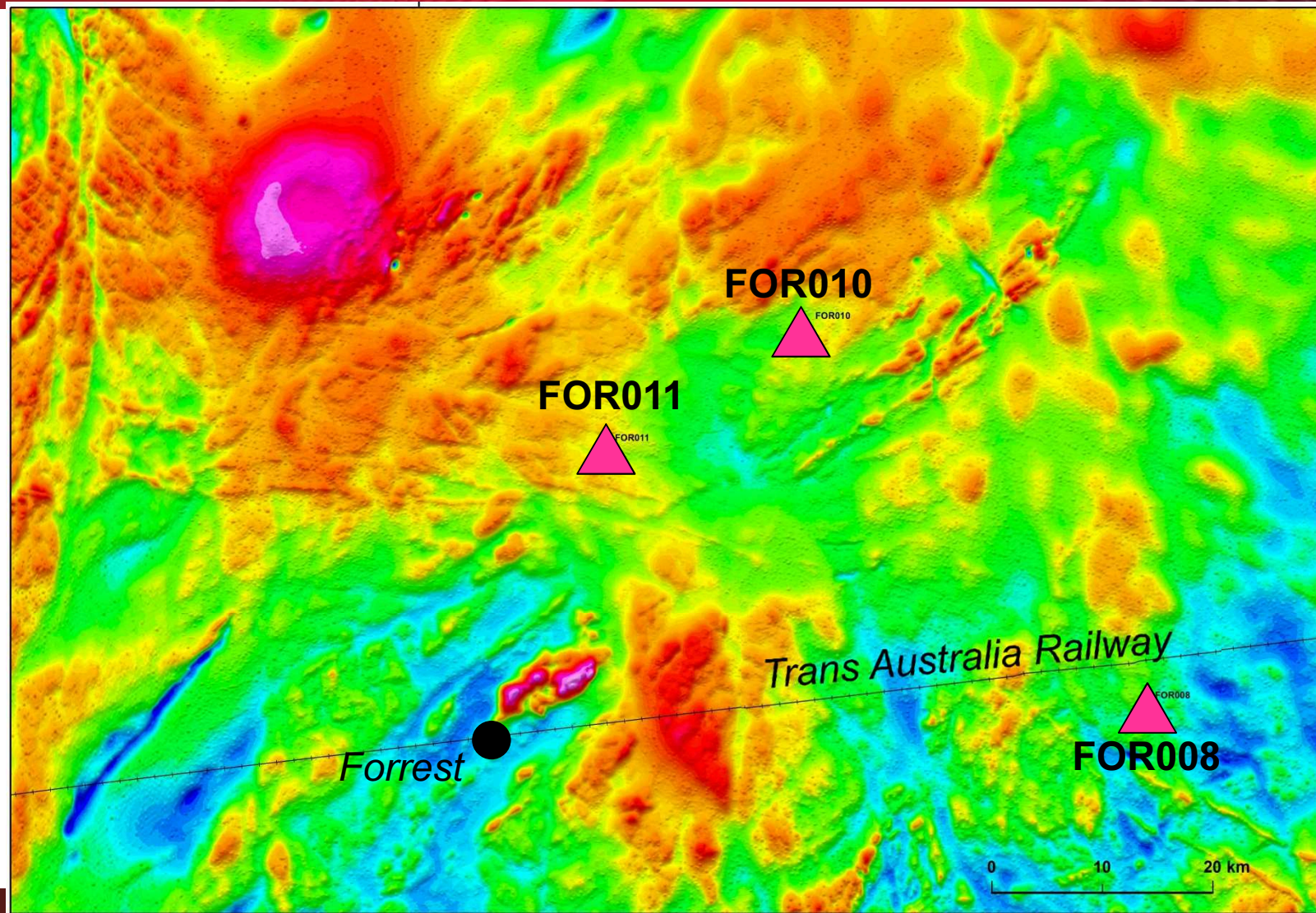


- Forrest Zone; western part of Coompana Province
- Separated from the Madura Province by the Mundrabilla Shear Zone
- Five stratigraphic cores drilled; first diamond cores
- Start with the northern part – FOR010 and FOR011

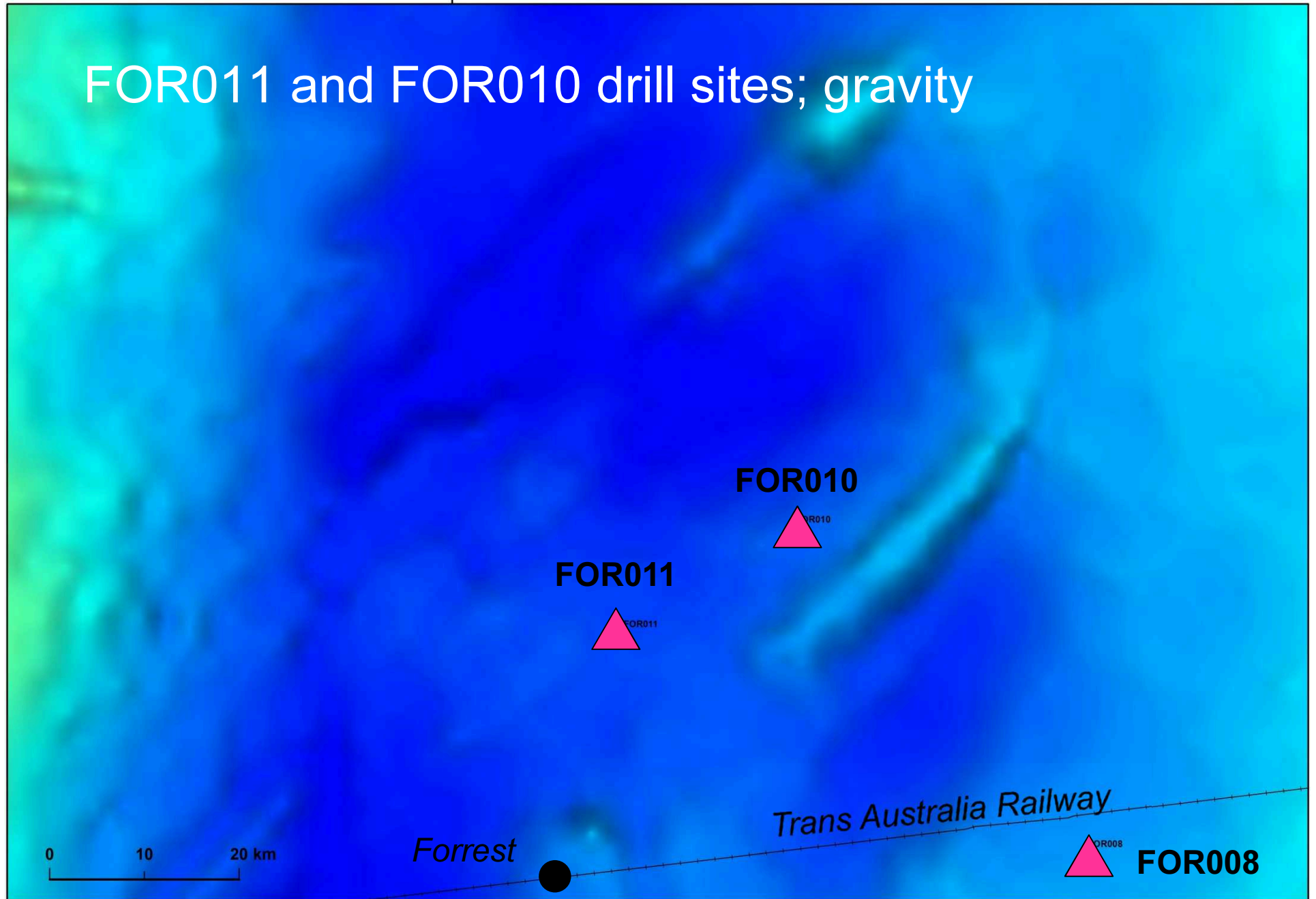
Gravity (colour) with 1VD magnetics (greyscale)



FOR011 and FOR010 drill sites; RTP magnetics



FOR011 and FOR010 drill sites; gravity



FOR011 drill core; basement at 285 m



Oldest rock types:

- Interlayered fine- to medium-grained, red, equigranular to seriate-textured metasyenite (Undawidgi Supersuite); undated metamonzodiorite to metagranodiorite;
- Undated fine-grained metagabbro (Host? High-K to shoshonitic)



FOR010 drill core; basement at 358 m



Complex core, five rock types identified.

Oldest rock types (Undawidgi Supersuite):

- Interlayered porphyritic biotite monzogranite gneiss (magnesian, alkali high-K) and tonalitic metagranite (magnesian, calcic-calc-alkalic)



Both FOR010 and FOR011 drill cores



New unit: **Bottle Corner Shoshonite**, named after Bottle Corner

- part of Moodini Supersuite
- intrudes Undawidgi Supersuite granites

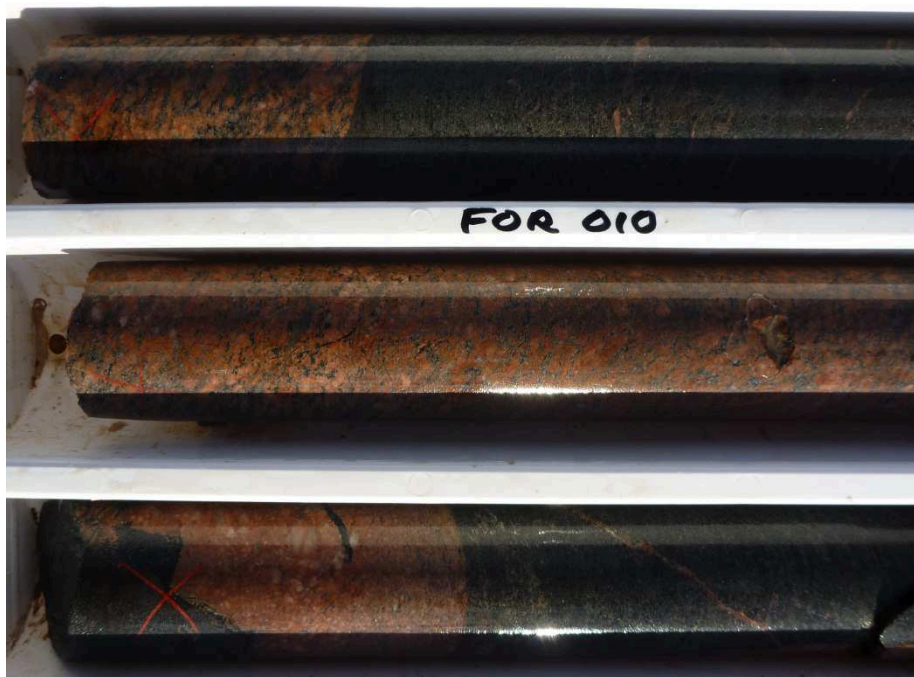


Both FOR010 and FOR011 drill cores



Bottle Corner Shoshonite (Moodini Supersuite):

- Mafic to intermediate, fine- to medium-grained, hornblende-biotite metagranite
- Typical assemblage plagioclase-K-feldspar-dark biotite-dark green hornblende phenocrysts-quartz-titanite
- Upper greenschist to low amphibolite facies; cut by shoshonitic syenogranite

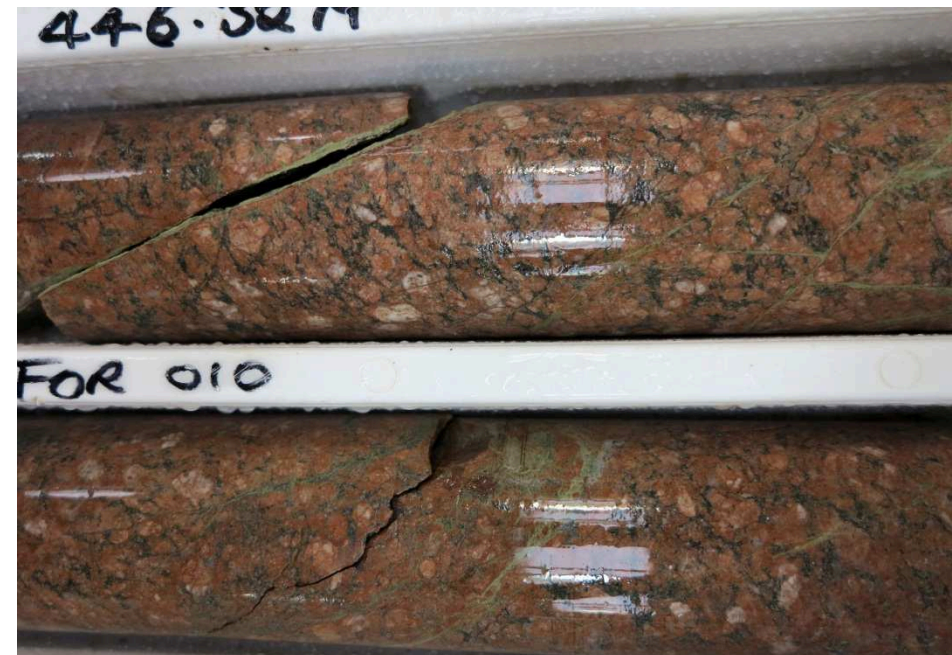


FOR010 and FOR011 drill cores



Bottle Corner Shoshonite (Moodini Supersuite):

- Late equigranular to porphyritic red (hematite-stained) syenogranite veins (FOR010; Si-rich evolved shoshonite) – cut foliations
- Commonly altered: chl-ep schist; qtz-ep-carbonate veins
- N-rich pegmatite (FOR011) – cuts foliation



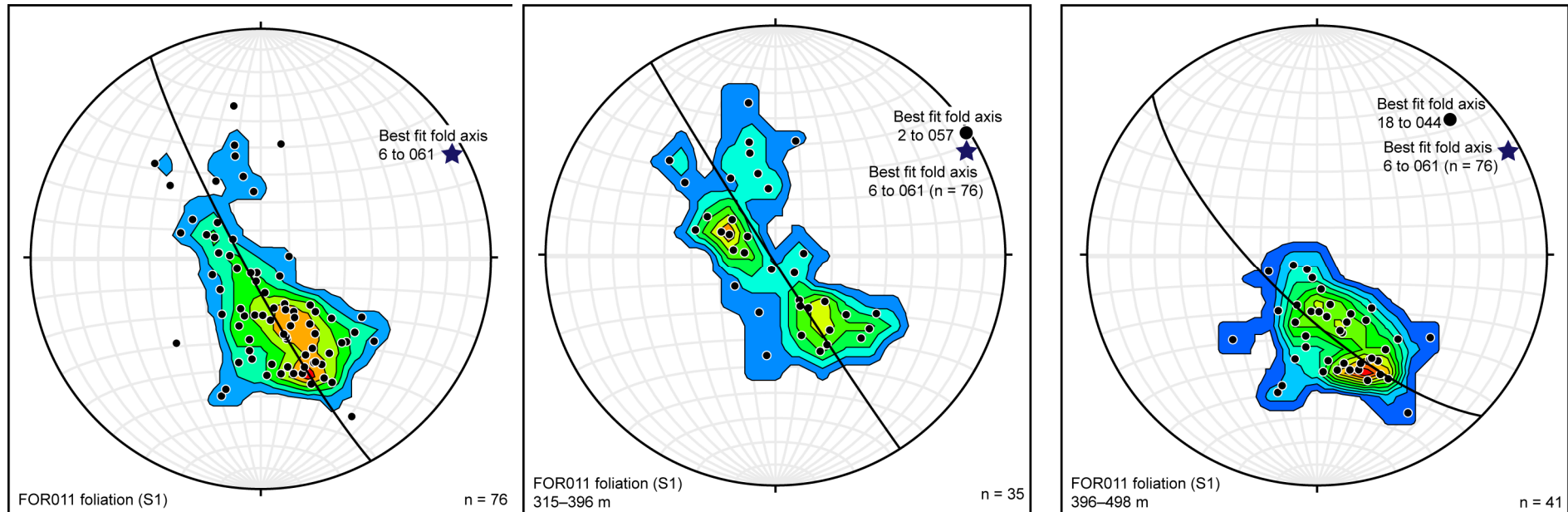
FOR010 and FOR011; sulfides



- Disseminated pyrite and chalcopyrite minor but reasonably common; one sample has molybdenite flakes
- Late syenogranite veins contain pyrite, chalcopyrite, rare galena



FOR011 drill core; structure

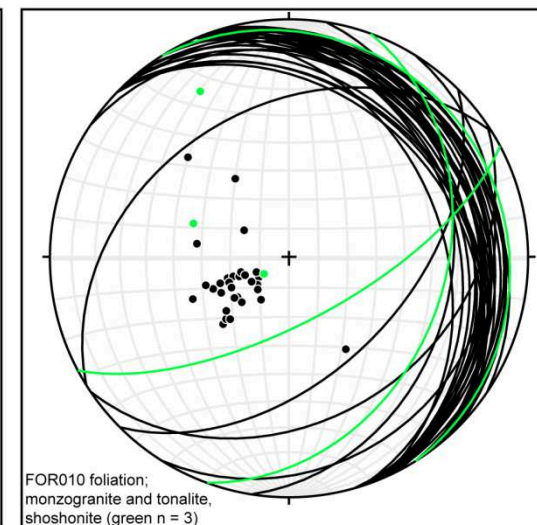
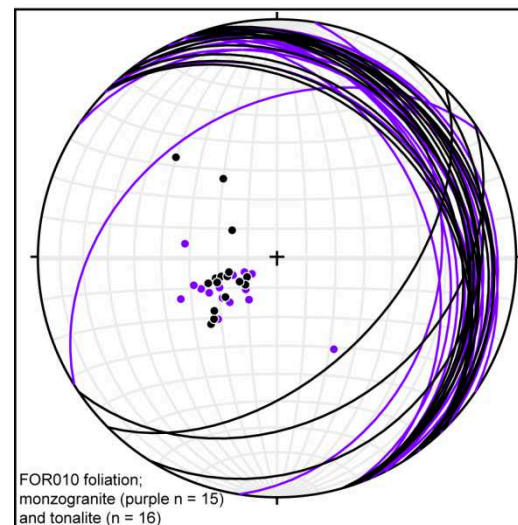
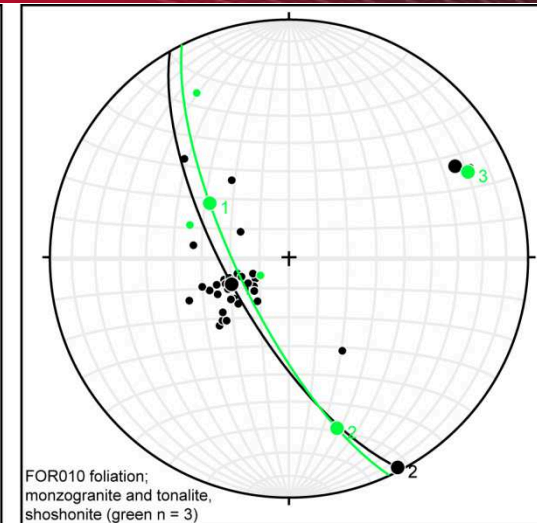
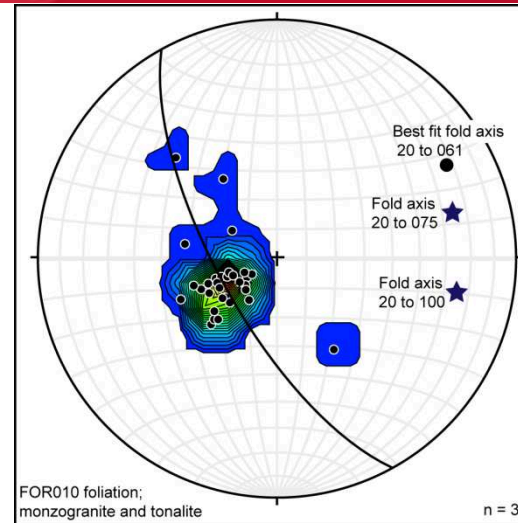


- Layering and S1 foliation in FOR011 dips both NW and SE in upper part of hole; mostly NW in lower part – shallow NE-plunging fold
- Includes Bottle Corner Shoshonite – cut by late Na-rich pegmatite

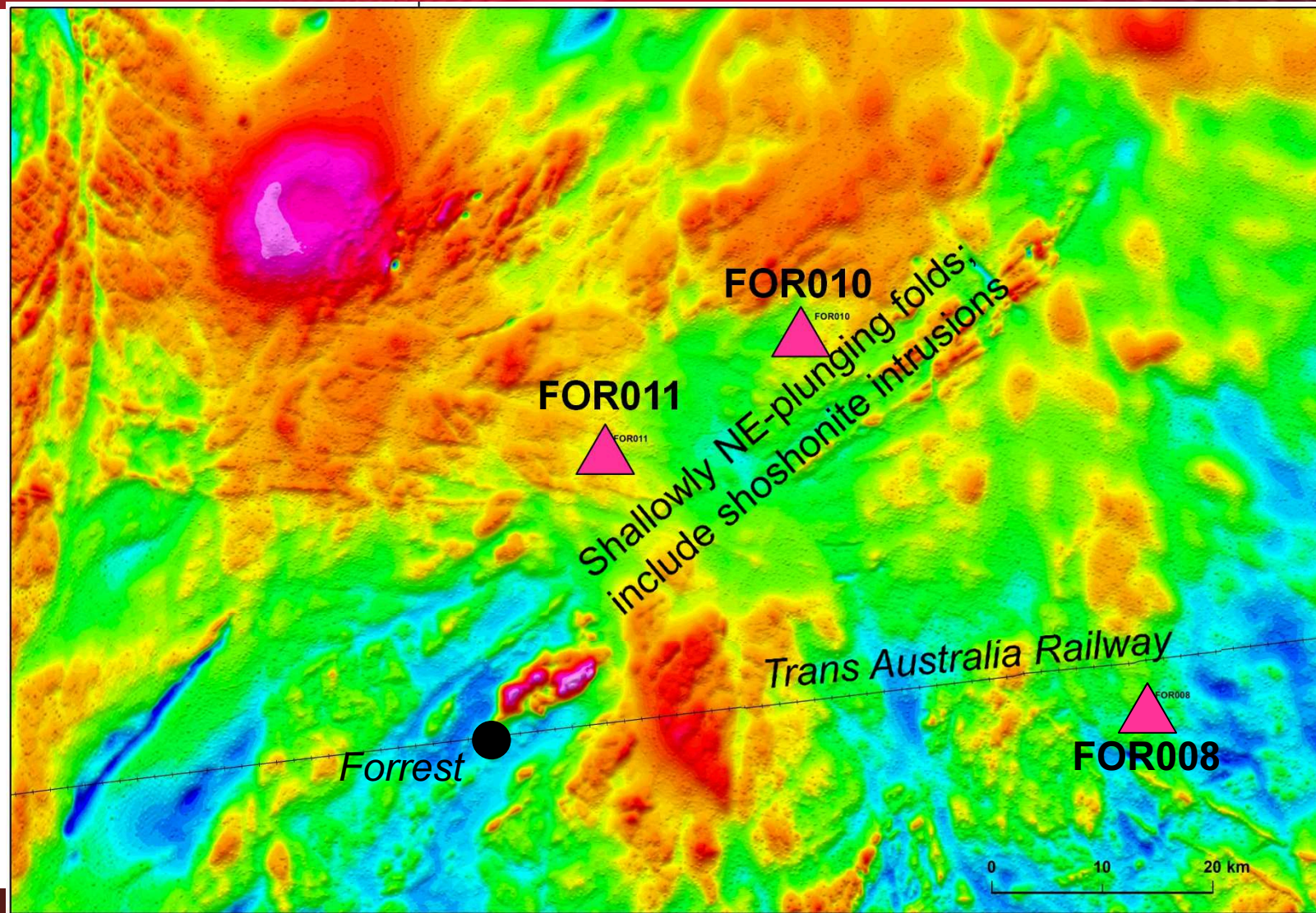
FOR010 drill core; structure






- Similar to FOR011
- Shallow NE-plunging folds; stereonet analysis similar to measured folds
- Dominant shallow to moderate NE-dipping foliation
- Core intersects part of a fold hinge zone
- Cut by syenogranite veins and some mafic-intermediate shoshonitic veins
- Deformation likely to have occurred during shoshonitic magmatism



FOR011 and FOR010 drill sites; RTP magnetics



FOR012 drill site

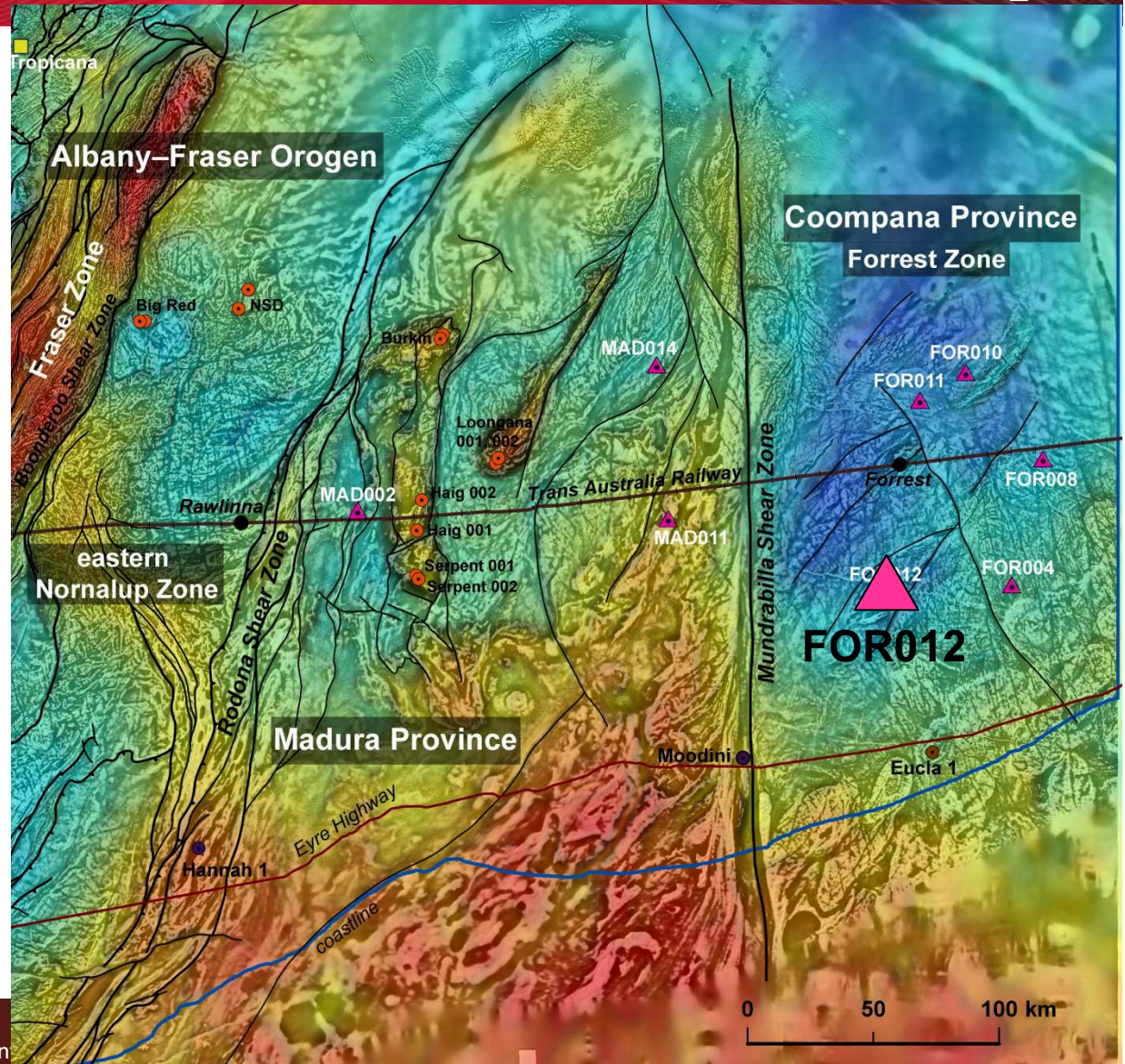
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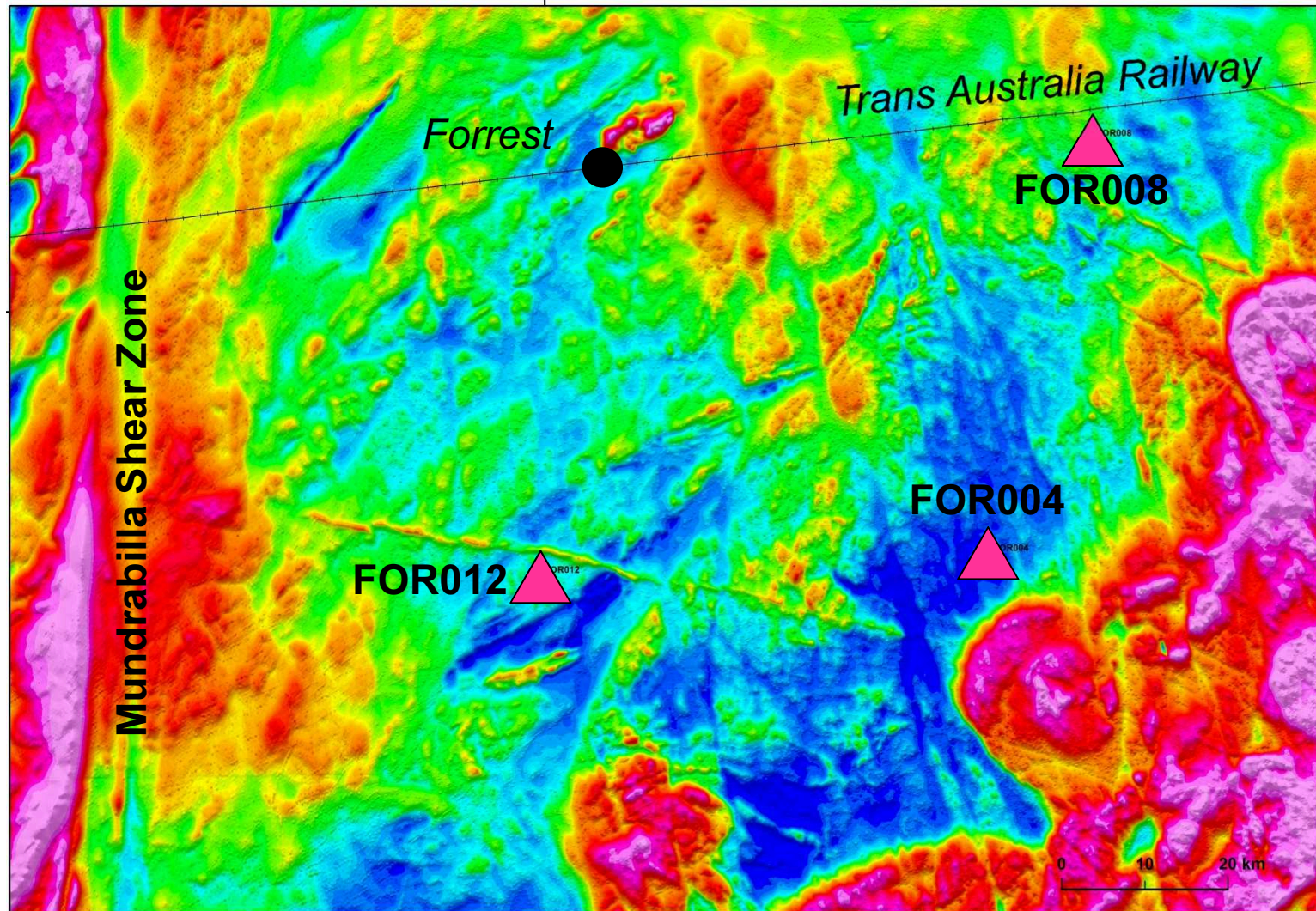
- South of railway line, and Forrest
- Intersected basement at 310 m
- Still the same at the surface....



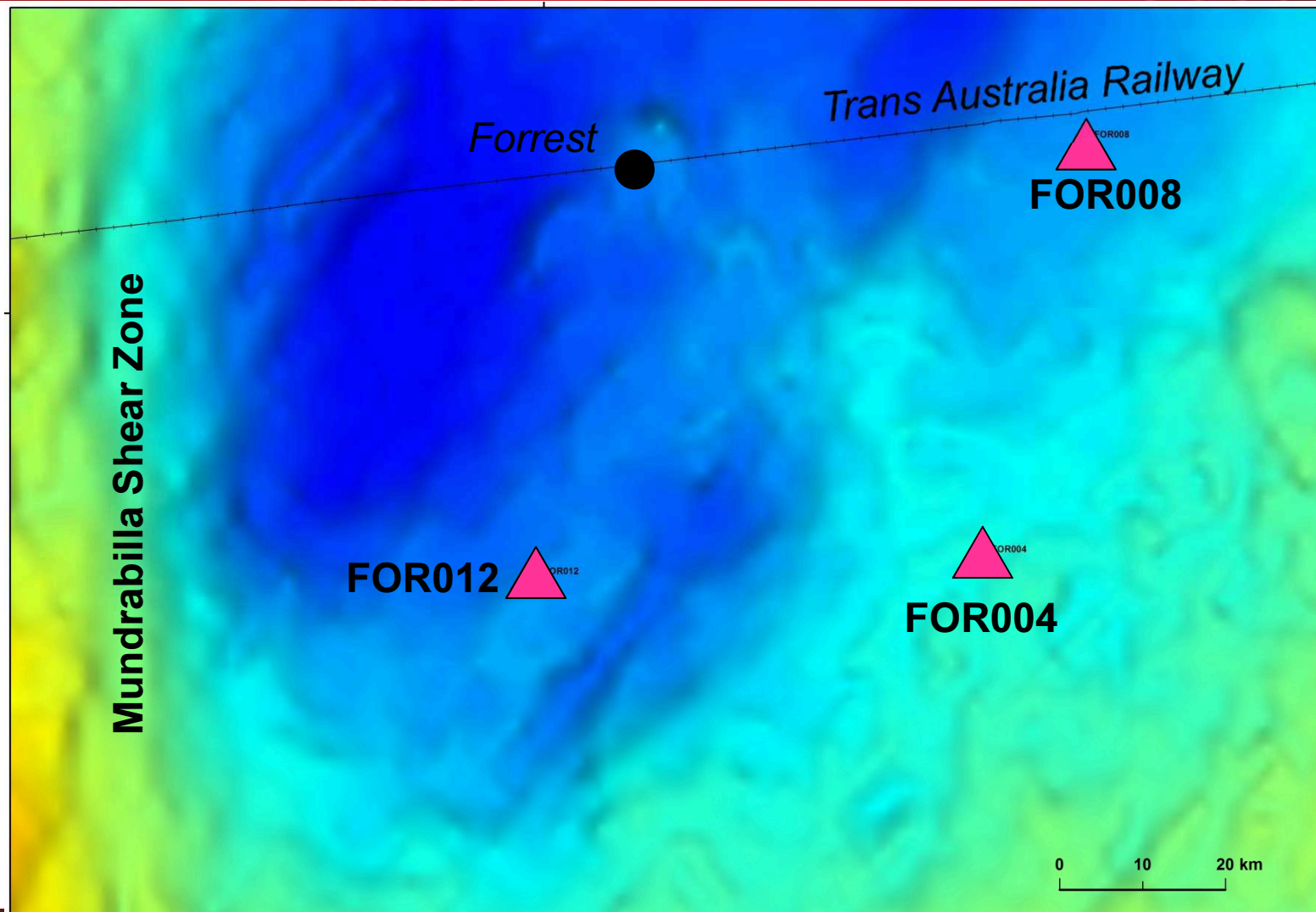
Gravity (colour) with 1VD magnetics (greyscale)



FOR012 drill site; magnetics



FOR012 drill site; gravity

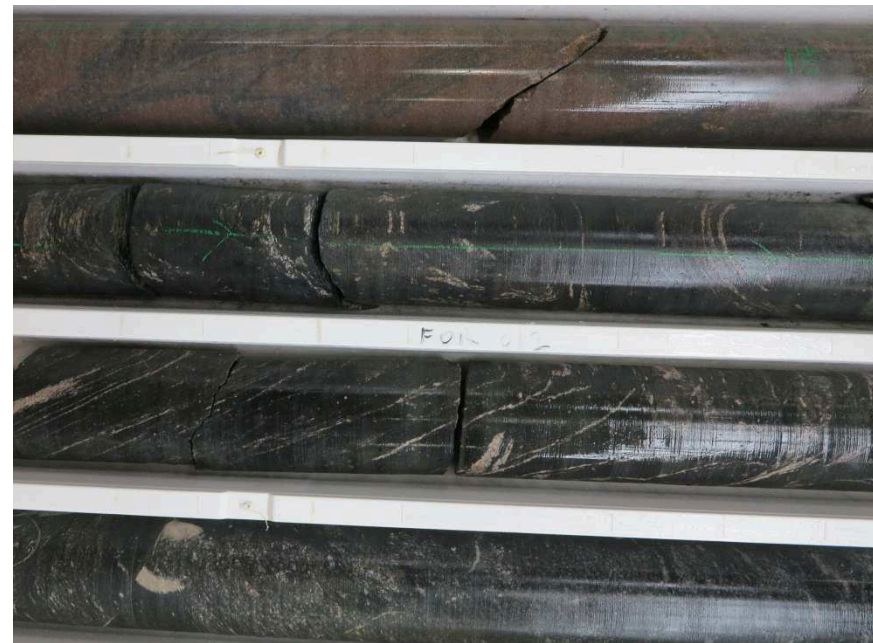


FOR012 drill core



Undawidgi Supersuite (magnesian to ferroan, alkali-calcic, high-K):

- Mylonitic to ultramylonitic fine- to medium-grained, locally thinly layered metagranite (high-level intrusion?)
- Round K-feldspar porphyroclasts, quartz ribbons, plagioclase, biotite, carbonate, titanite, magnetite
- Mafic to intermediate, micaceous schist; wispy carbonate veins



FOR012 drill core



Undawidgi Supersuite (magnesian to ferroan, alkali-calcic, high-K):

- Intensely foliated to mylonitic, fine-grained, grey to dark grey schist; felsic metavolcanic or high level metagranite; wispy carbonate veins
- Plagioclase phenocrysts-white mica-chloritised biotite-quartz-albite-titanite-magnetite
- Upper greenschist facies



FOR012 drill core; sulfides



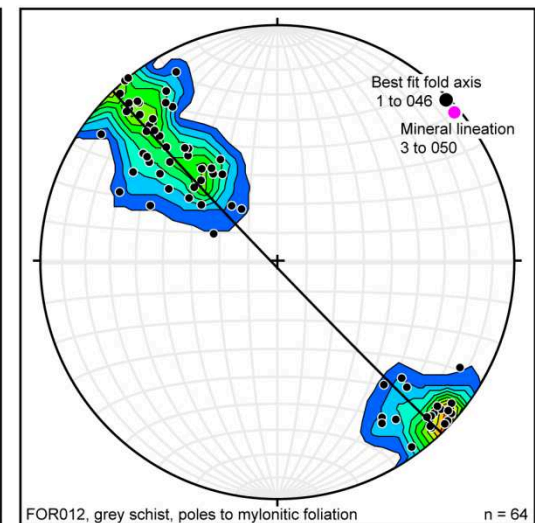
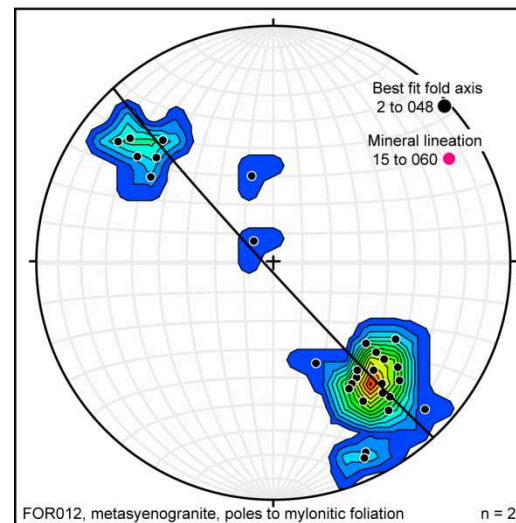
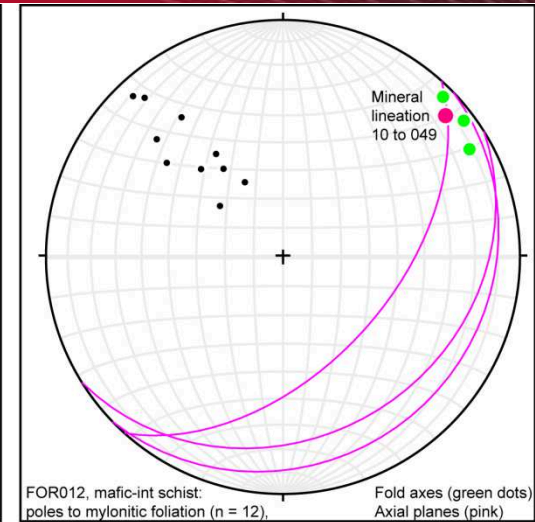
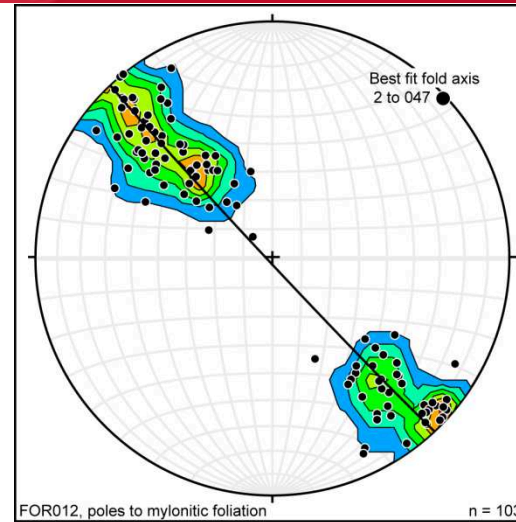
- Minor disseminated pyrite and chalcopyrite, associated with magnetite
- GSWA 206795 (25 cm ½ HQ core) 1172 ppm Cu (white mica-rich matrix)
- Carbonate-quartz-pyrite-magnetite-chalcopyrite veinlets, cut foliation



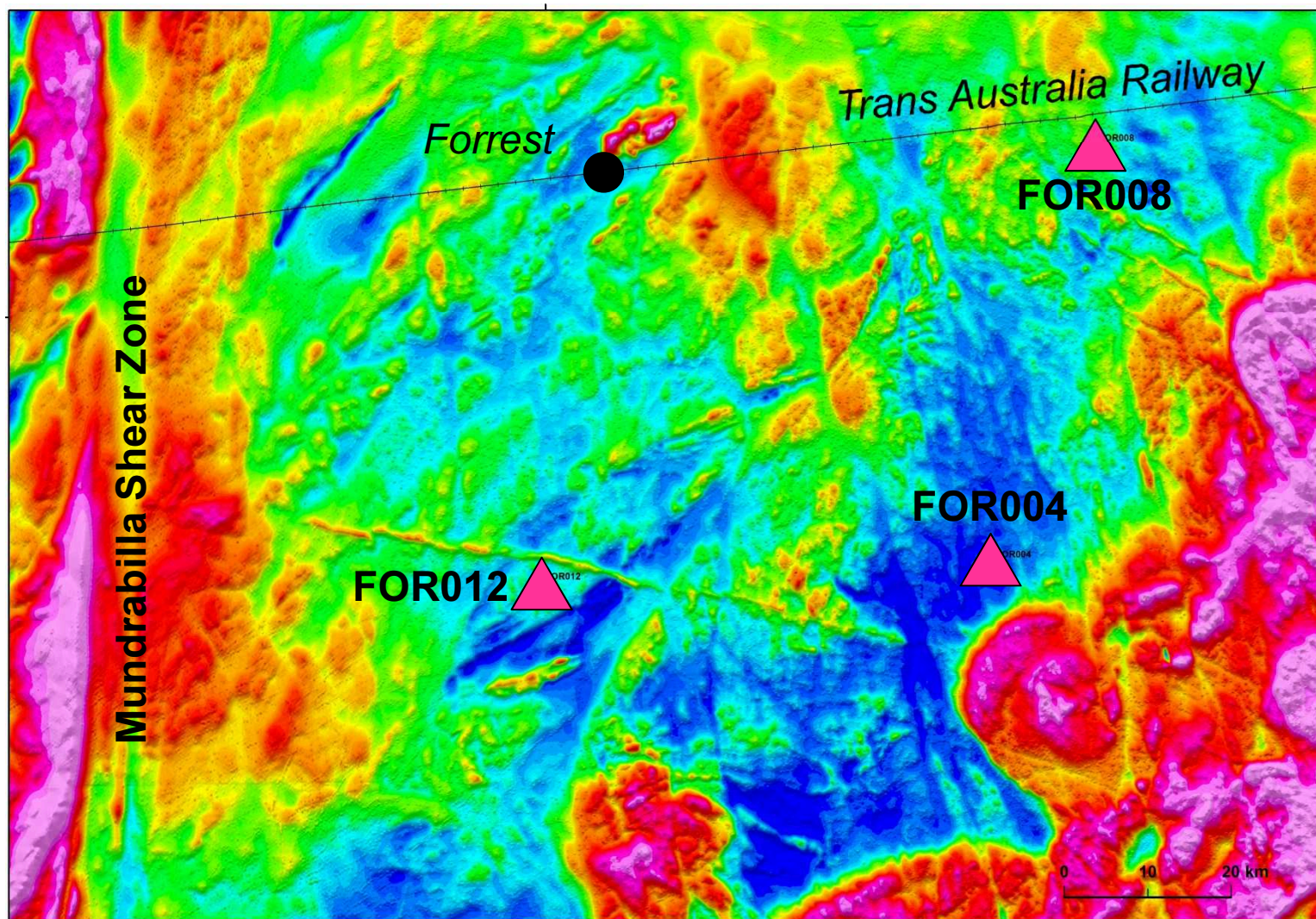
FOR012 drill core; structure of the 'wedge'



- Upper mylonitic metagranite dominant moderate NW dip, subhorizontal mineral lineation
- No regular asymmetry
- Small-scale folds, particularly in mafic schist – shallow NE-plinges, moderate-shallow SE-dipping axial planes
- Grey schist similar to mylonite in upper part of core
- Together suggests larger-scale shallowly inclined to subhorizontal folding with the core intersecting an upper limb dipping predominantly to the northwest (upper part of the core), and a lower limb dipping to the southeast, with a fold closure to the northwest



FOR008 drill site; magnetics



FOR008 drill core; basement at 380 m



Toolgana Supersuite (magnesian, calc-alkalic, high-K):

- Medium- to locally coarse-grained, red to grey, seriate-textured to porphyritic (up to 4 cm), biotite-rich, locally hornblende-bearing, migmatitic, granodiorite to monzogranite gneiss; localised leucosome veins and patches (melt)
- Plagioclase-orthoclase-quartz-hornblende-biotite-magnetite(hematite)-titanite



FOR008 drill core; basement at 380 m



Toolgana Supersuite (magnesian, calc-alkalic, high-K):

- Interlayered with medium-grained, monzodiorite gneiss (high-K, calc-alkalic)
- Zones of chlorite-epidote-hematite greenschist facies alteration
- Locally stockwork veins; carbonate veins; fluorite



FOR008 drill core; sulfides



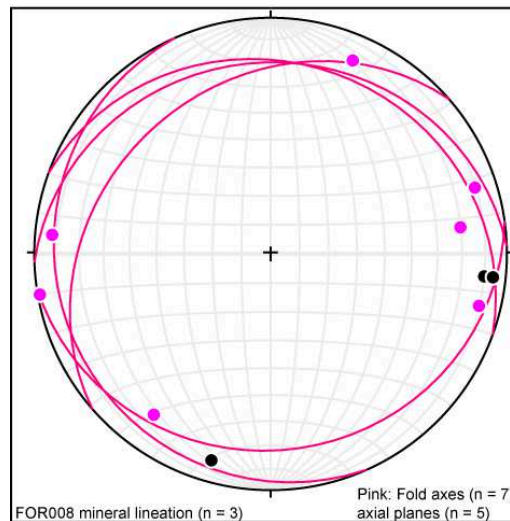
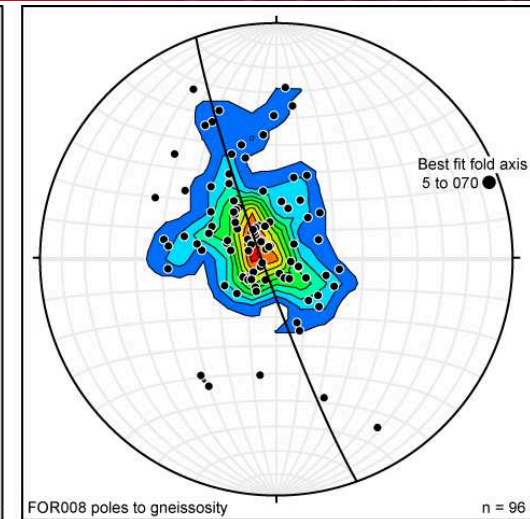
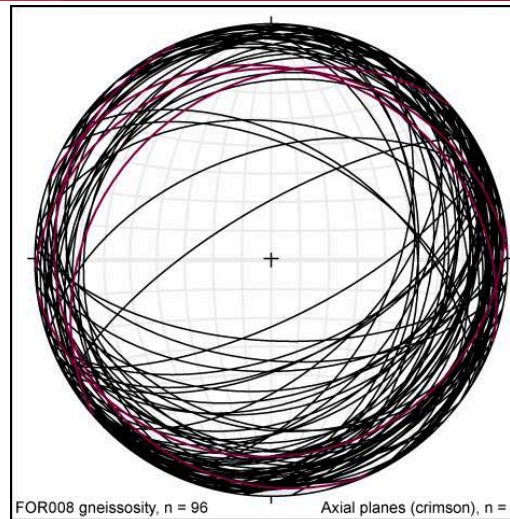
- Occur locally; chalcopyrite veinlets near Fe-rich biotite in stringers with abundant magnetite altered to hematite
- Coarse-grained porphyritic granite gneiss (GSWA 219012, 20 cm $\frac{1}{2}$ HQ core) contains 1154 ppm Cu – patchy chlorite (from biotite) and sericite (from plagioclase) alteration, and hematite staining



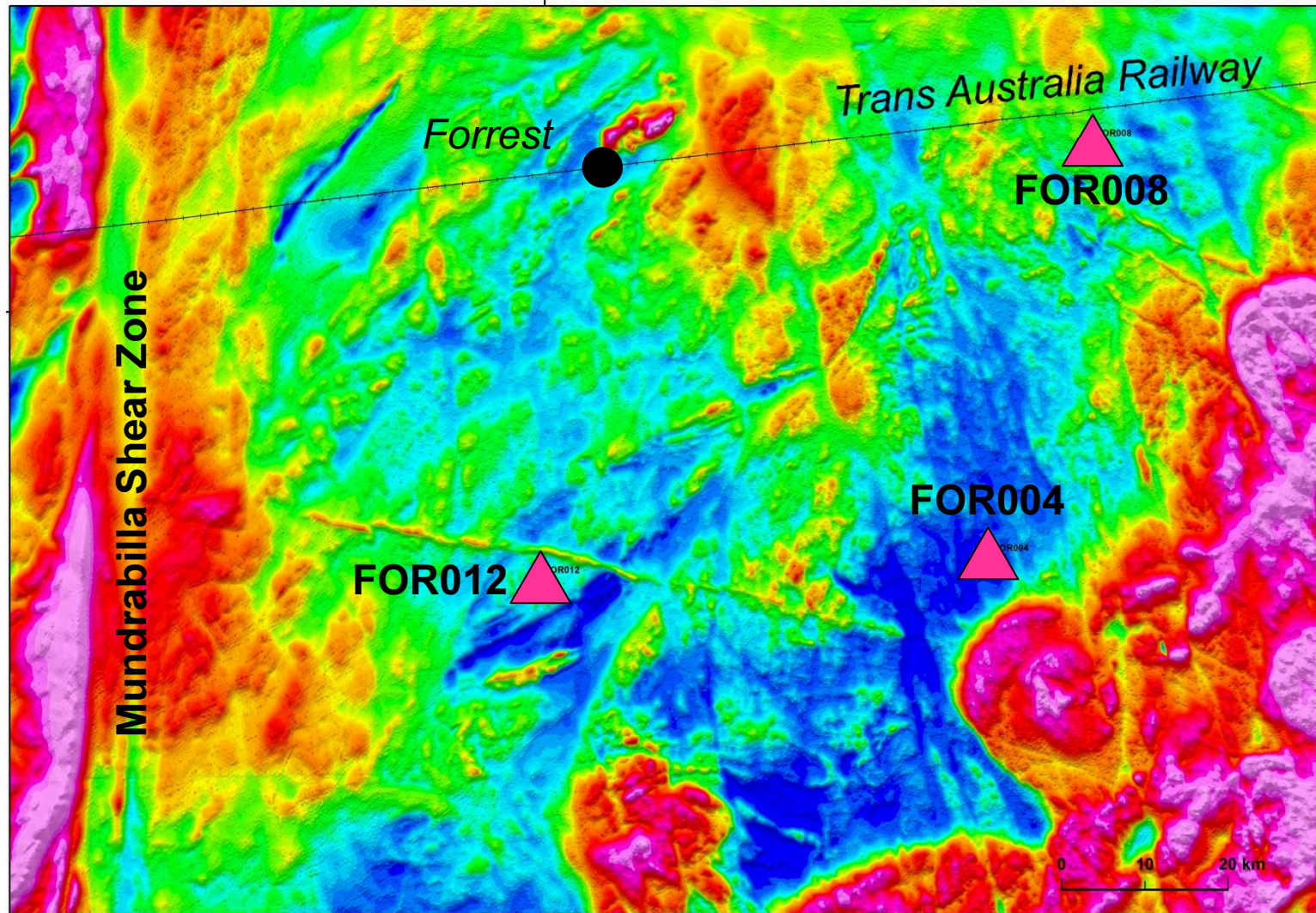
FOR008 drill core; structure



- Moderate to strong gneissosity that has a variable, dominantly shallow dip
- Locally folded into flat-lying, small-scale Z-folds and curvilinear folds
- Subhorizontal anastomosing mineral lineation
- Kinematics (porphyroclasts, kinks) suggest top to NW shear sense
- The relationships indicate a history of top to the west or northwest transport (prior to or during migmatization), recumbent folding and probable thickening of the pile, closely followed by partial melting.
- Pre-dates greenschist alteration



FOR004 drill site; magnetics

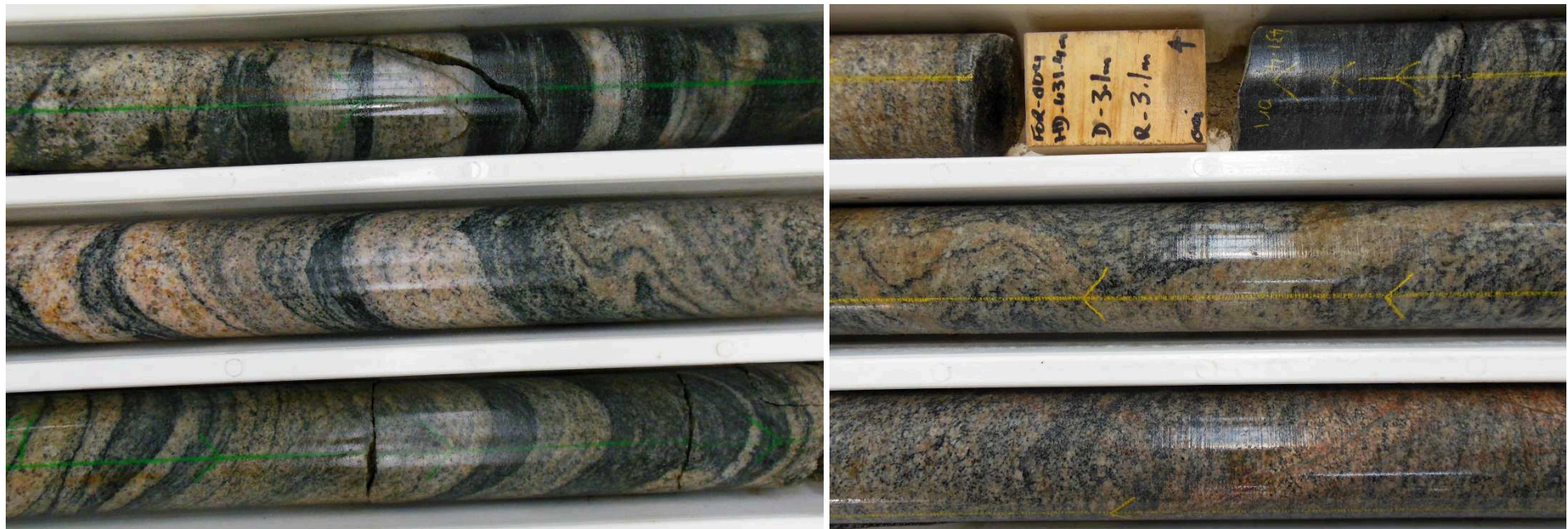


FOR004 drill core; basement at 390 m



Toolgana Supersuite (magnesian, calc-alkalic, medium- to high-K):

- Medium-grained, mesocratic, mostly equigranular, granodioritic to monzogranitic gneiss
- Intruded by fine- to medium-grained, equigranular to seriate-textured, biotite leucogranite, which includes wisps and schleiren of fine-grained metadiorite and metagranodiorite.
- Generally variable proportions of plagioclase-orthoclase-quartz-biotite-hornblende-titanite-magnetite



FOR004 drill core; sulfides



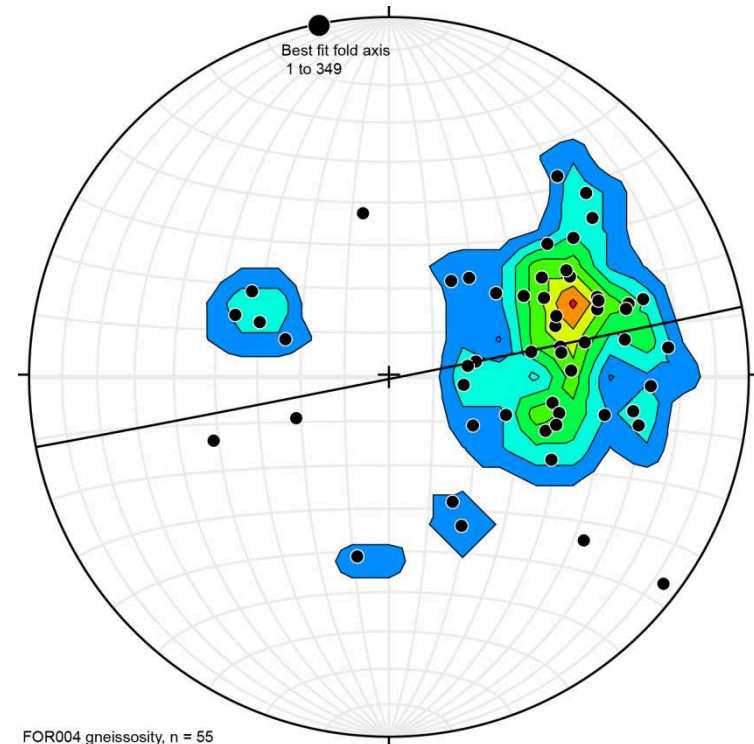
- Retrograde alteration: biotite to chlorite-sericite, plagioclase to sericite; sericite–carbonate–albite–chlorite alteration
- Chlorite–epidote–quartz veins cut the foliation and folds
- Sparse chalcopyrite and rare bornite



FOR004 drill core; structure



- Gneissic foliation in upper part of the core dominated by a west to southwest dip, and could be part of a larger fold nose, shallowly plunging west
- Variable in lower part and generally switches between southeast and west-southwest dips
- Small-scale folds shallowly inclined with shallow plunges mostly around 20° towards 280
- Small-scale refolded folds in more mafic layers; similar west-plunging F2 folds
- Cut by the veins and alteration.



Summary



- Several types of granitic rocks, ranging from migmatites, to gneisses, to foliated metagranites
- Typically interlayered with metamafic or metadioritic rocks
- Possible felsic volcanics (FOR012) - strongly deformed
- Bottle Corner Shoshonite – prevalent in the northern Forrest Zone
- Greenschist alteration throughout; sulphides
- Still trying to work out what all this means.....

