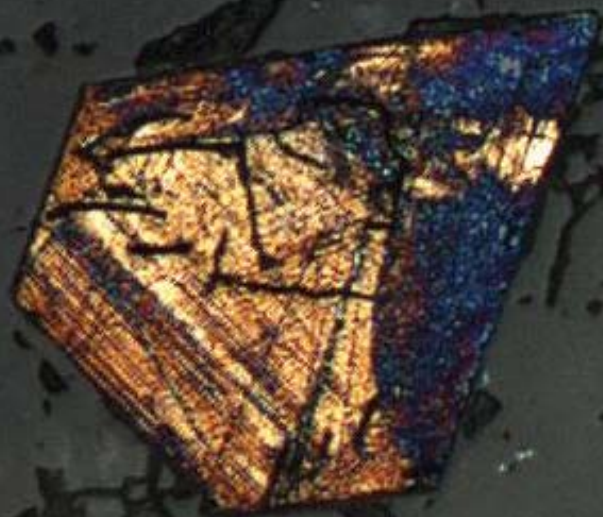


# Fosterville on the Tamar?:

Turbidite-hosted auriferous  
pyrite-arsenopyrite  
mineralisation at Lefroy, NE  
Tasmania

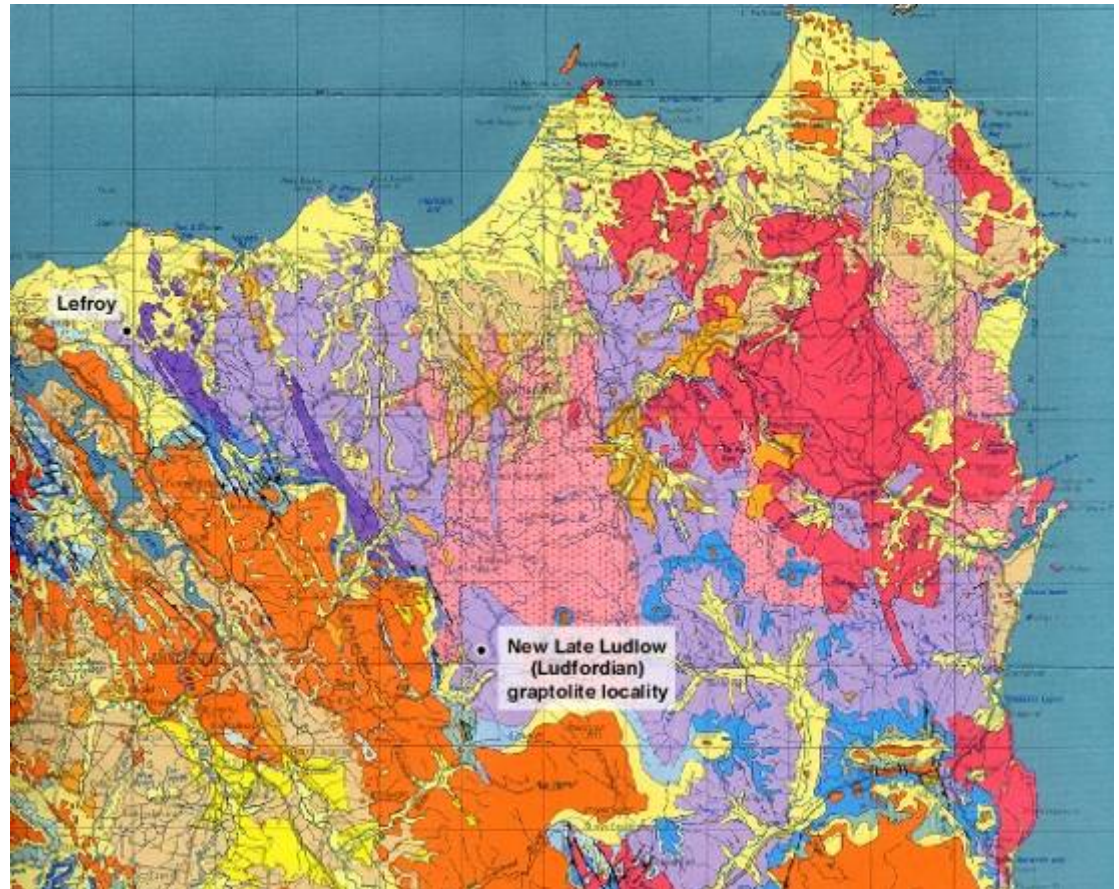


Robert Scott, CODES

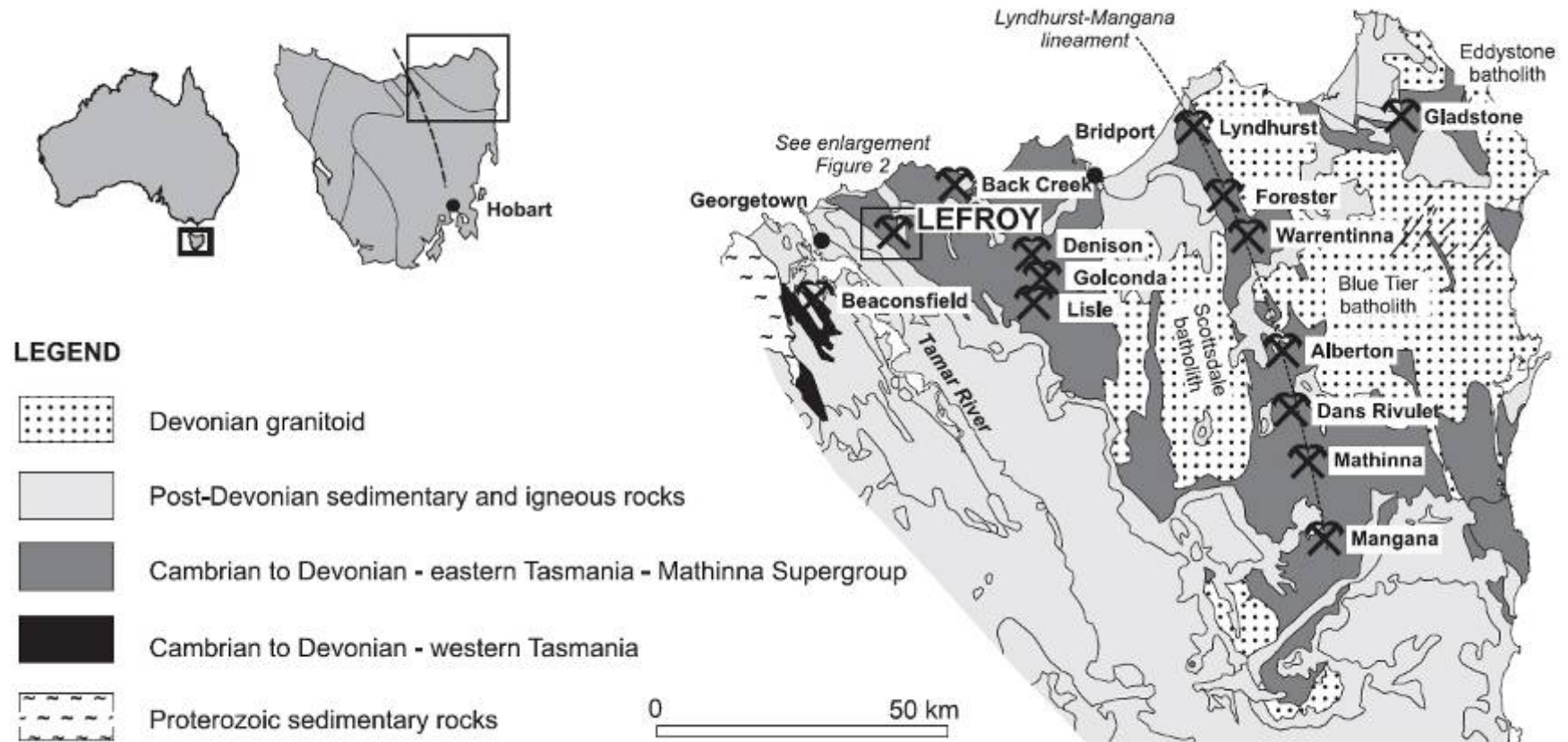


# New Case Study

- **Baseline data from barren/poorly endowed basin succession for comparison with world-class districts**
  - Not feasible due to budget restrictions?
- **Opportunity knocks!**
  - **Lefroy Resources**
    - Fosterville look-a-like?
  - **David Seymour (MRT) new graptolite discovery in NE Tasmania**
    - Hosted by weakly deformed (grain-scale) unaltered pyritic black shale

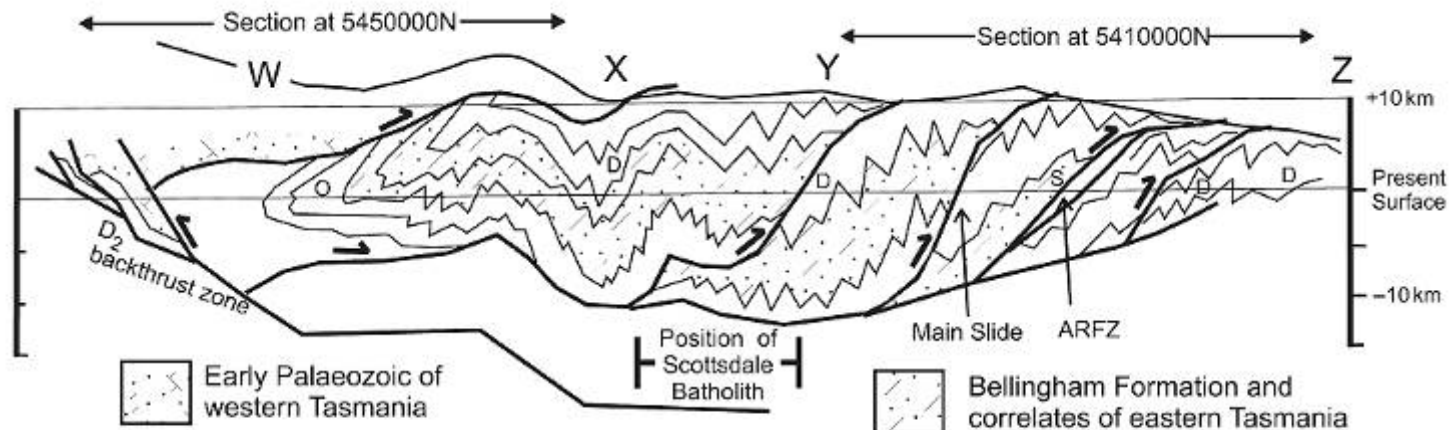


# Gold deposits in NE Tasmania



# Tectonic models for NE Tasmania

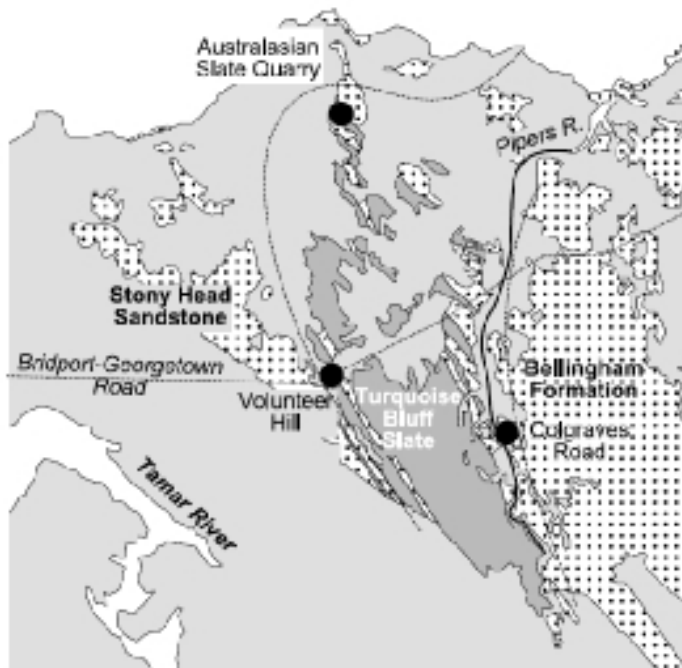
- **Only Mid-Devonian (Tabberabberan) deformation** affects the early Ordovician to Devonian Mathinna Group
  - e.g. Patison et al. (2001)
- **Early Silurian (Benambran) deformation** affects Ordovician strata in **Pipers River – Lefroy region** (“recumbent domain”)
  - e.g. Reed (2001)
  - Major (faulted?) unconformity separates Ordovician and (Late) Silurian – Devonian successions



**Figure 7** Schematic cross-section of the Mathinna Group. Projected positions of fossils are indicated as O, Ordovician; S, Silurian; D, Devonian. See text for sources of data used in construction. Section is drawn as if granites had not intruded the area. ARFZ, Avenue River Fault Zone. W, X, Y and Z refer to the approximate position of the section along the line shown in Figure 1.

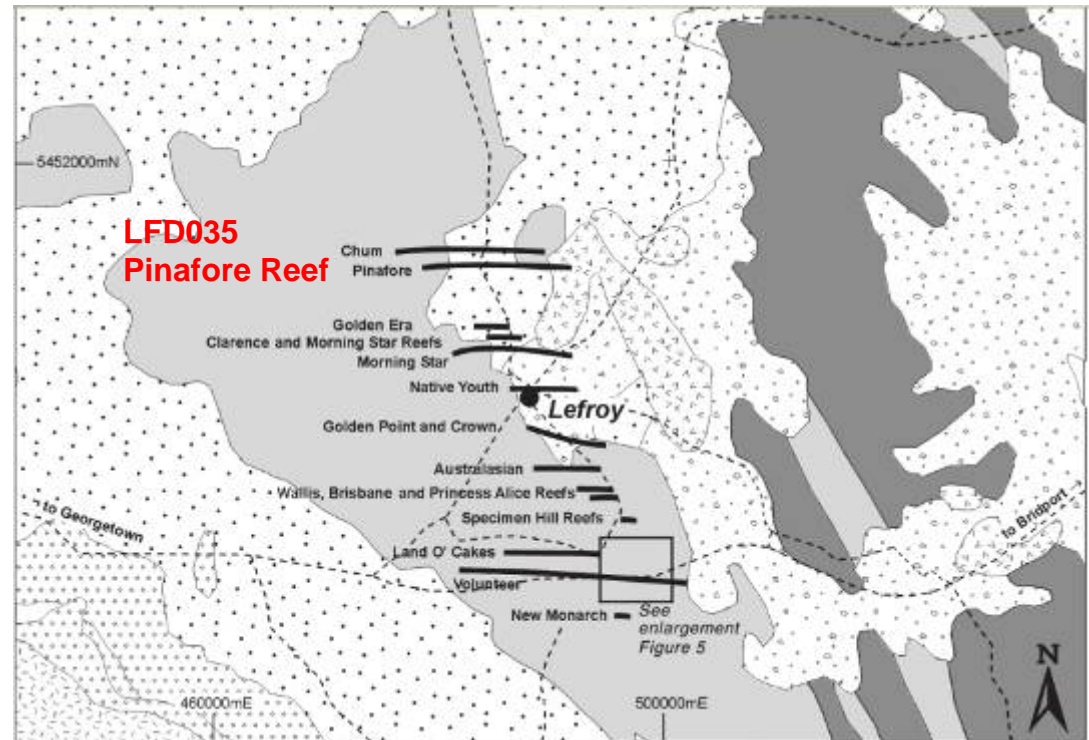


# Lefroy Region



## LEGEND

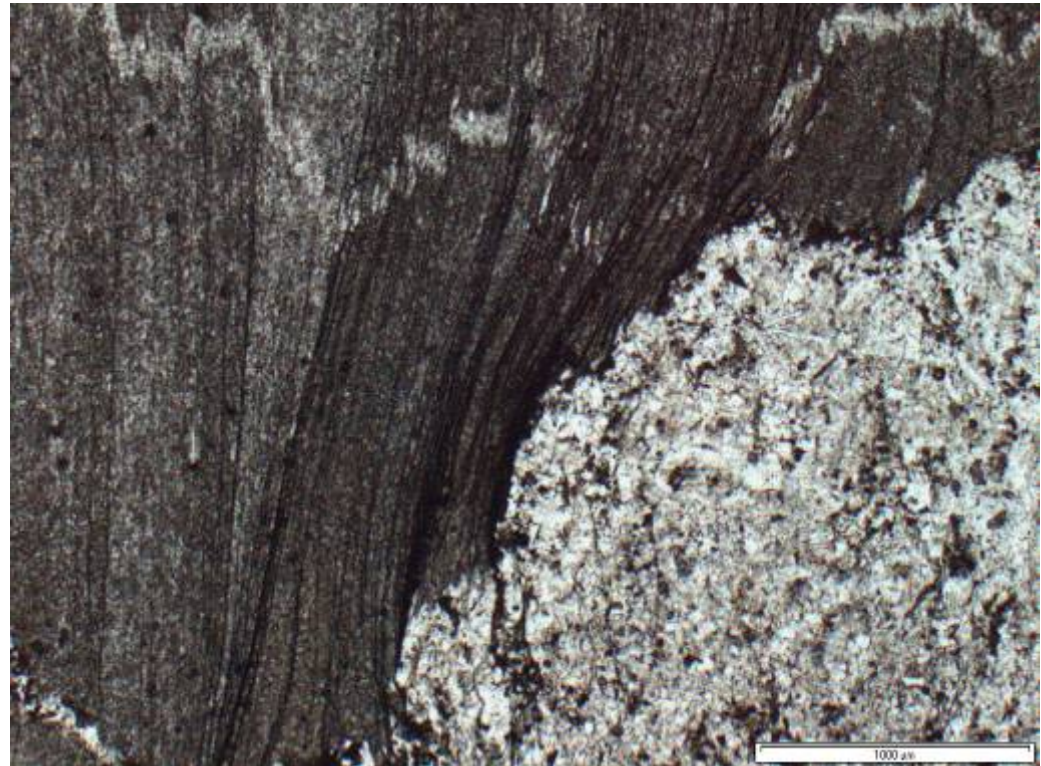
5 km



- Disseminated auriferous pyrite-arsenopyrite  $\pm$  free Au in quartz veins along steeply south dipping reefs
- Mid-Devonian (D2) cuts recumbent folds (D1) at a high-angle
  - Similar geometry to Tasmania Reef, Beaconsfield

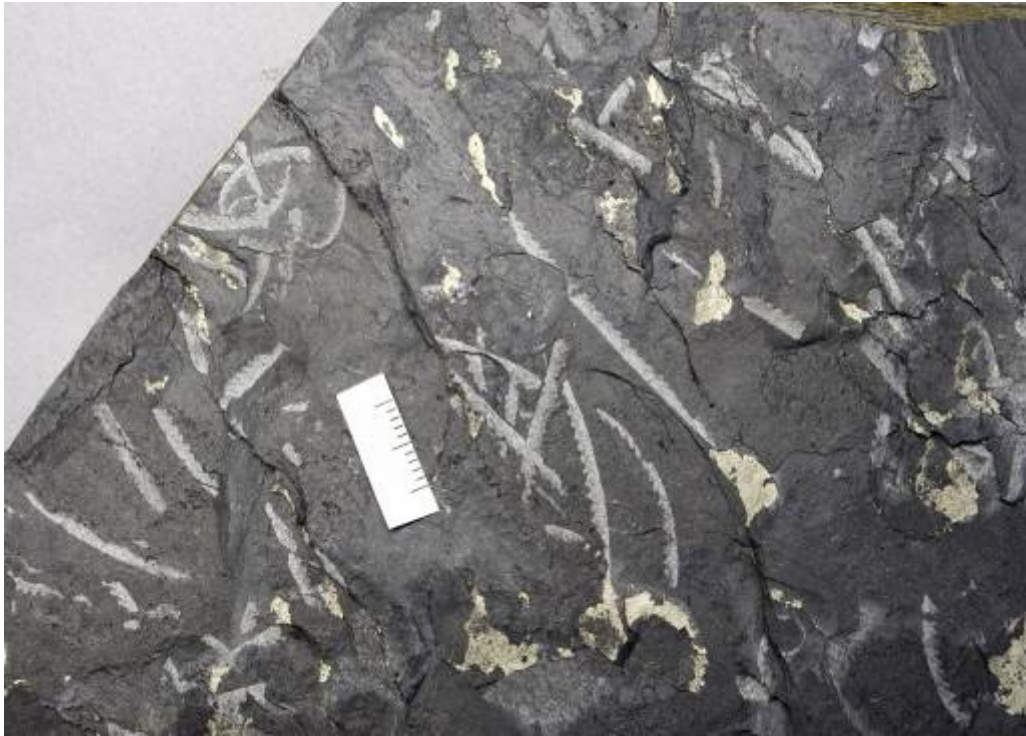
# Tectonic fabric development in host-rocks

- Early foliations in the E. Ord Stony Head Sandstone (host-rock to reefs) indistinguishable from S1 and S2 (Benambran) in the Bendigo-Ballarat zone, Victoria
  - These predating the NE-dipping mid-Devonian crenulation cleavage, generally called S2 in NE Tas.
- Although previously termed a slaty cleavage, the cleavage axial planar to the recumbent folds at Lefroy is a fine crenulation cleavage identical to the dominant S2 cleavage in the Bendigo area





# New Ludlow Graptolite Locality



# Missing tectonic fabrics?

- **Ludlow (Late Silurian)** graptolite bearing black shale only contains a single relatively weak slaty cleavage

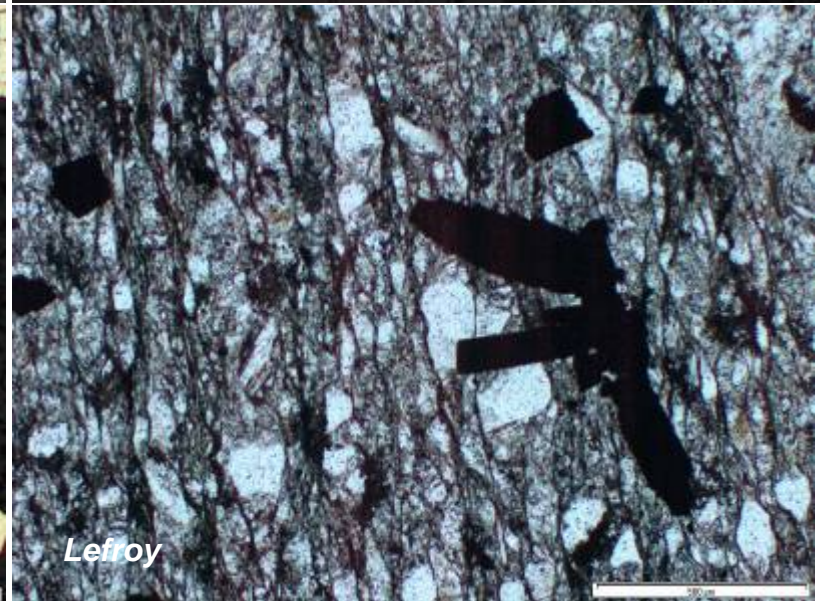
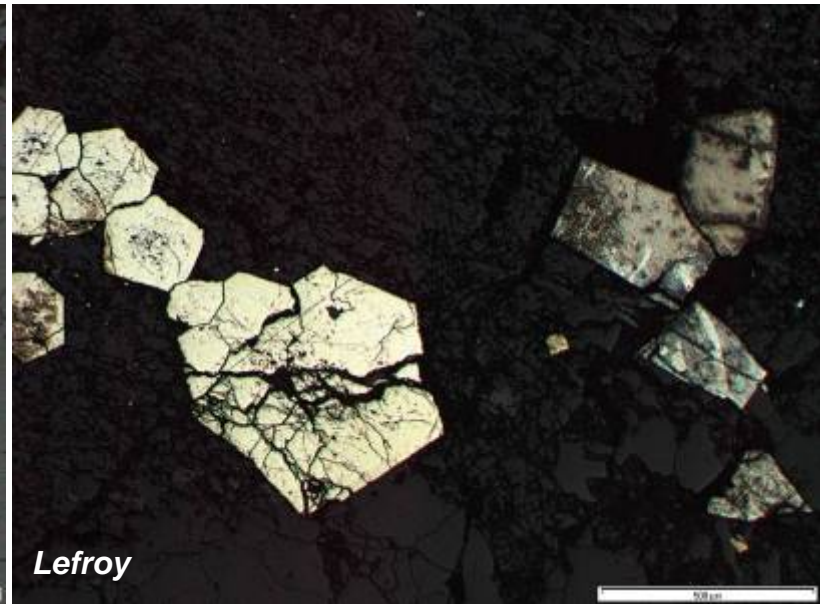


*From: Reed (2001)*

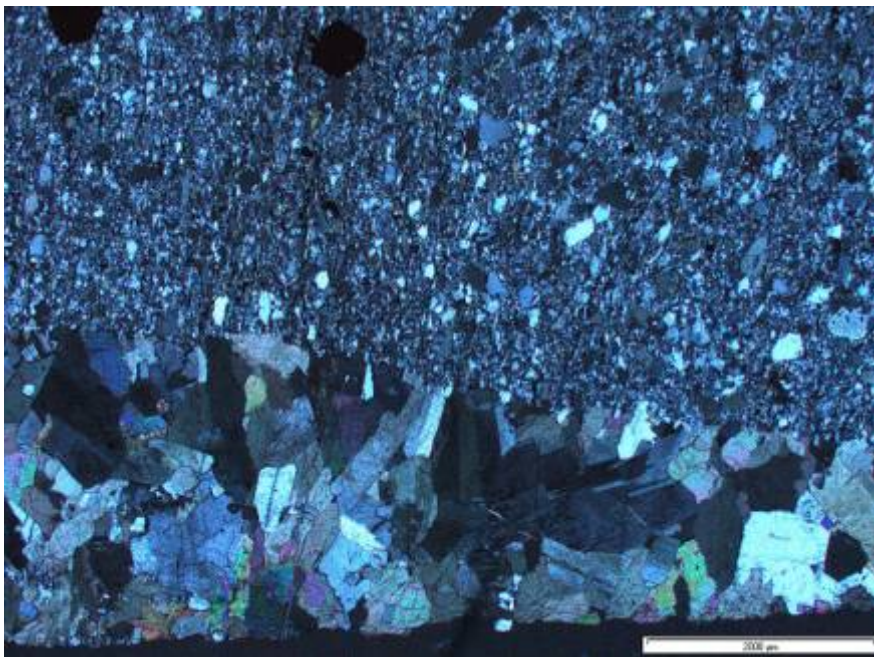
**Figure 7** Proposed correlation between Proterozoic rocks in western Tasmania with those underlying the Melbourne Zone in Victoria, and between eastern Tasmania and the Tabberabbera Zone in eastern Victoria.



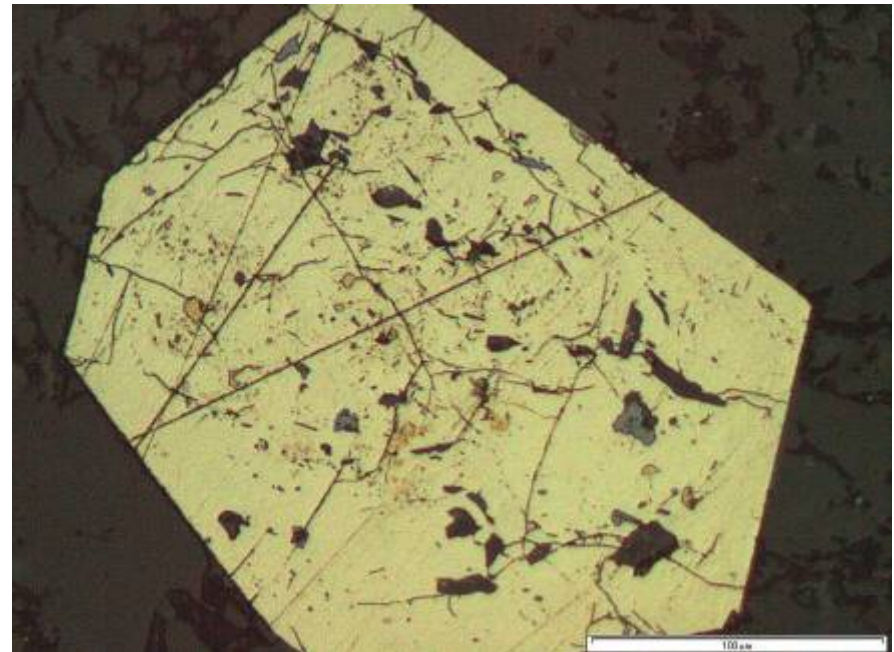
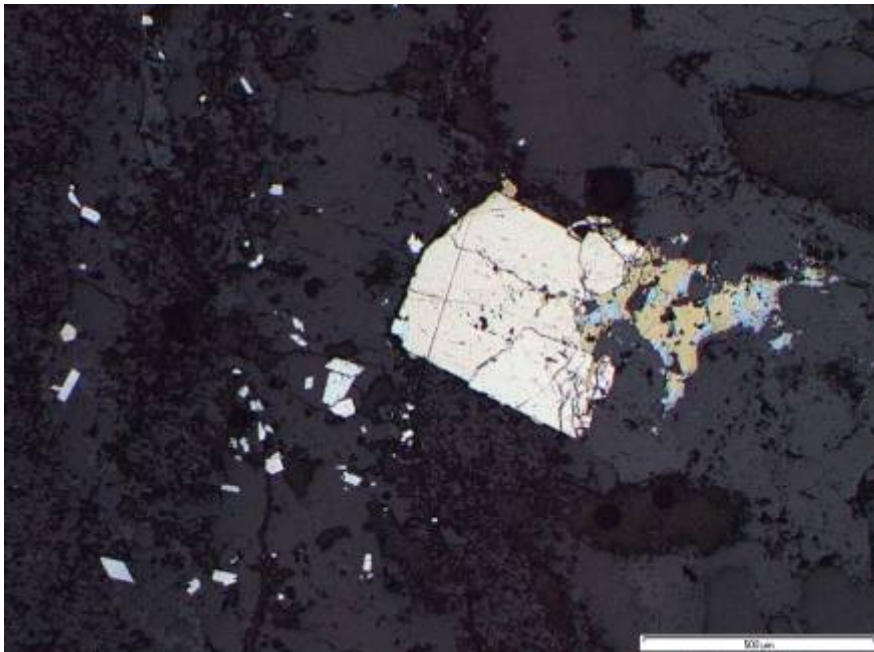
# Auriferous pyrite-arsenopyrite, Lefroy





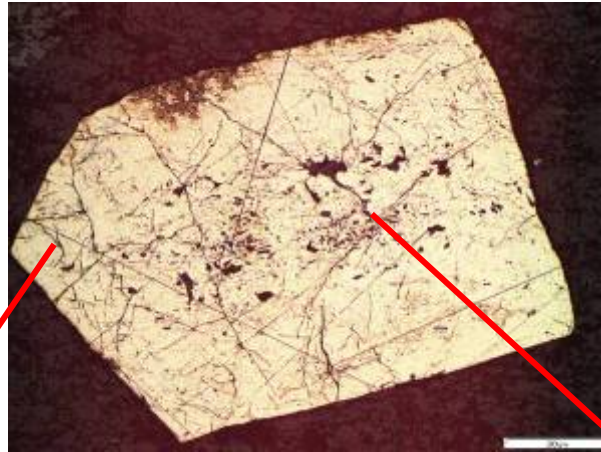


- **Auriferous py-asp mineralisation at Lefroy differs from that at Fosterville in that it has:**
  - Free Au association
  - Lower Au – As in pyrite
  - Minor to abundant albite in “ore stage” quartz carbonate veins
  - Sphalerite + chalcopyrite inclusions in “ore stage” pyrite and associated veins
  - Less antimony? (NB. minor stibnite, tetrahedrite and bournonite in association with Au reported in previous studies at Lefroy)





# Composition of ore-stage pyrite



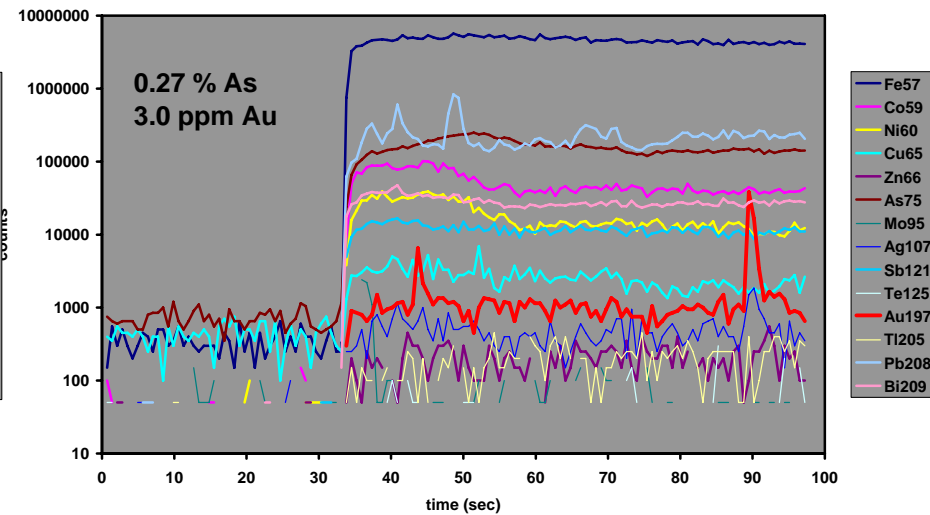
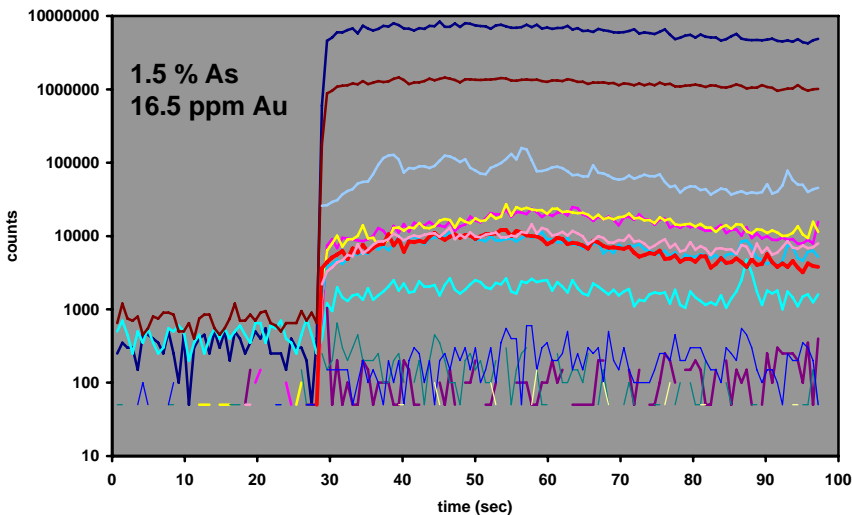
Relatively inclusion-free

As at Fosterville, the transition from inclusion-rich cores to inclusion-free overgrowths is marked by an increase in As and Au content and a decrease in most other trace elements

Inclusion-rich core

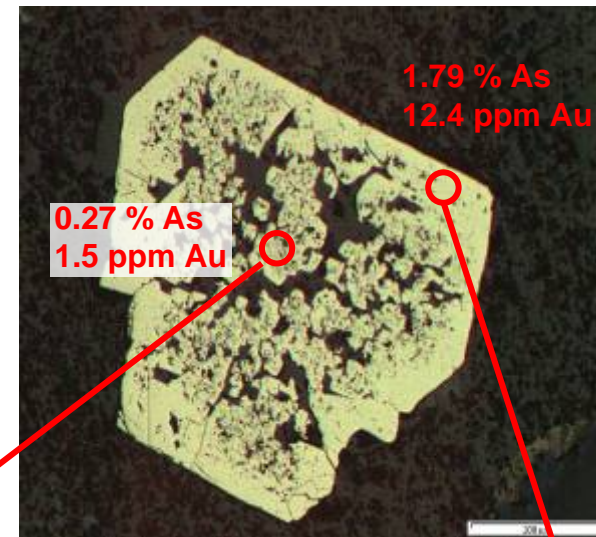
Tab ChartC:\DATA\060214\FE14A48.D

Tab ChartC:\DATA\060214\FE14A47.D

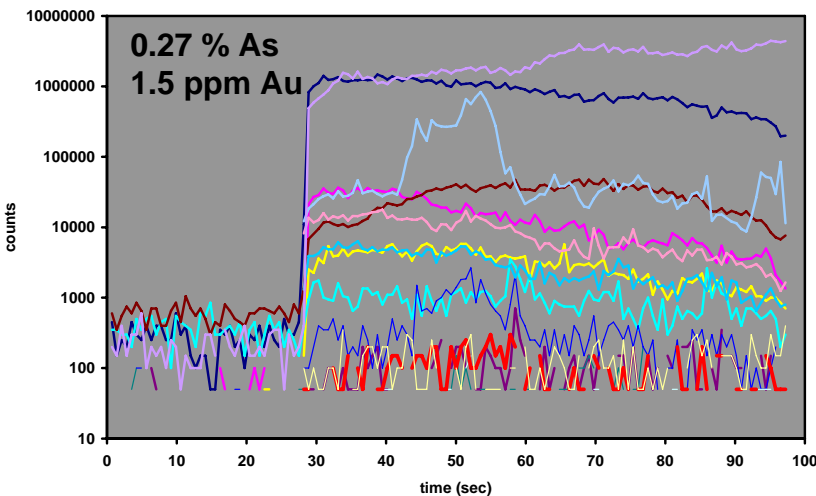


# Distal epigenetic pyrite

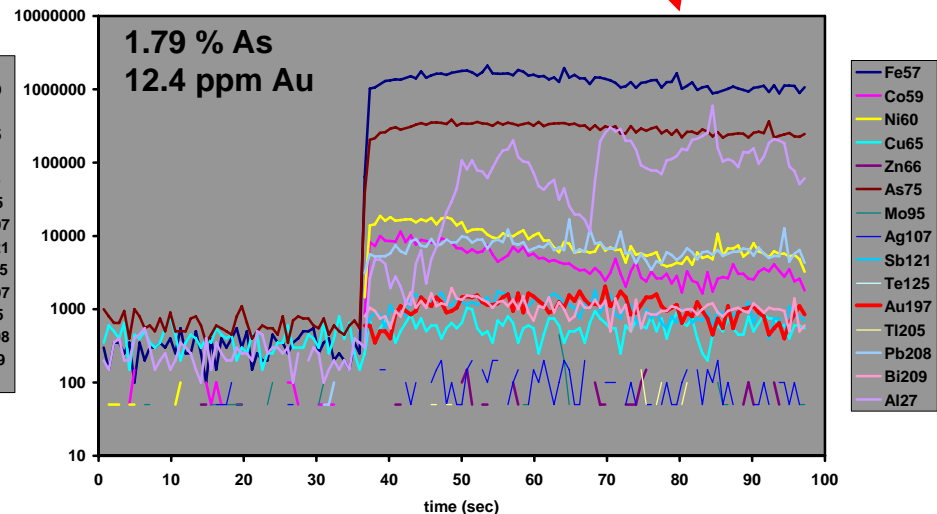
- Host-rocks predominantly relatively clean  $\pm$  carbonate-altered quartz sandstones (similar to Bendigo)
- “Distal disseminated” epigenetic pyrite at Lefroy is similarly abundant to Bendigo and has similar grain morphologies
  - commonly associated with widely dispersed narrow quartz + carbonate veinlets at Lefroy



Tab ChartC:\DATA\060214\FE14A36.D



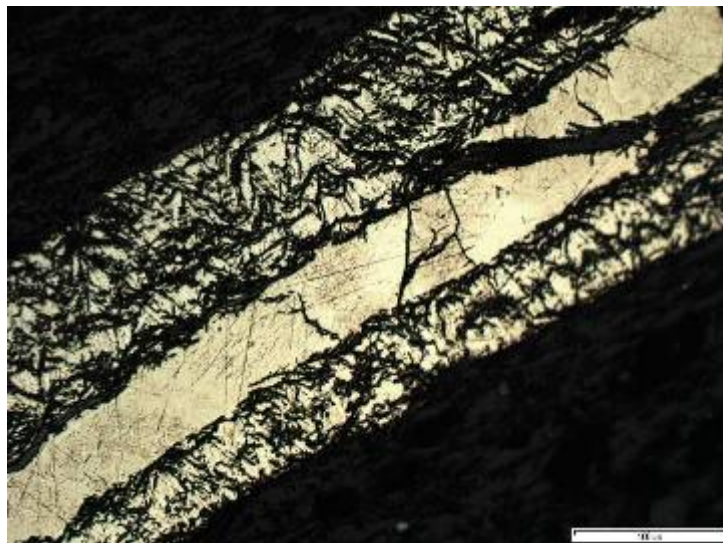
Tab ChartC:\DATA\060214\FE14A37.D





# Trace element composition of diagenetic pyrite and host shale

13

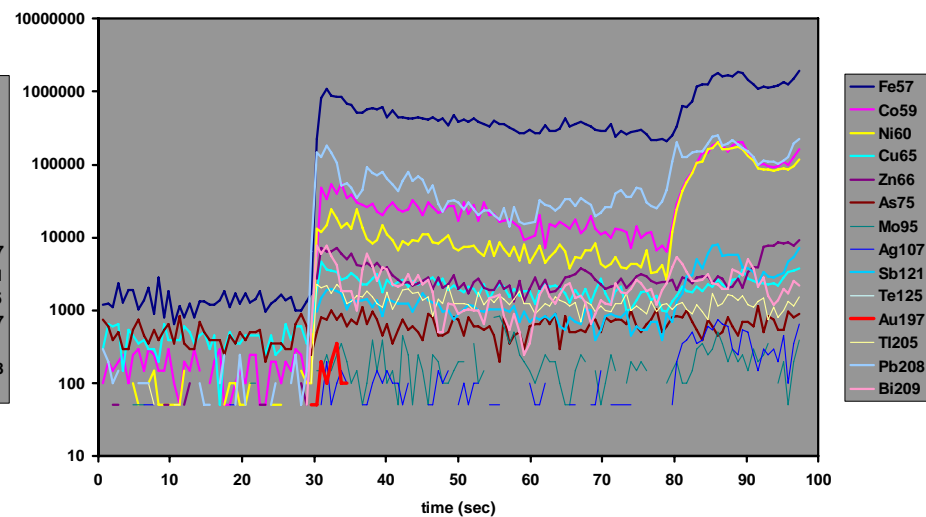
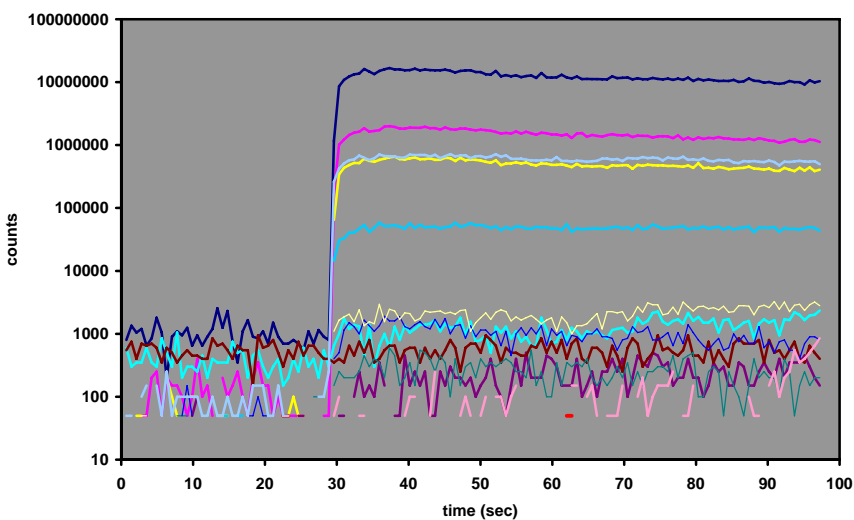


Pyrite

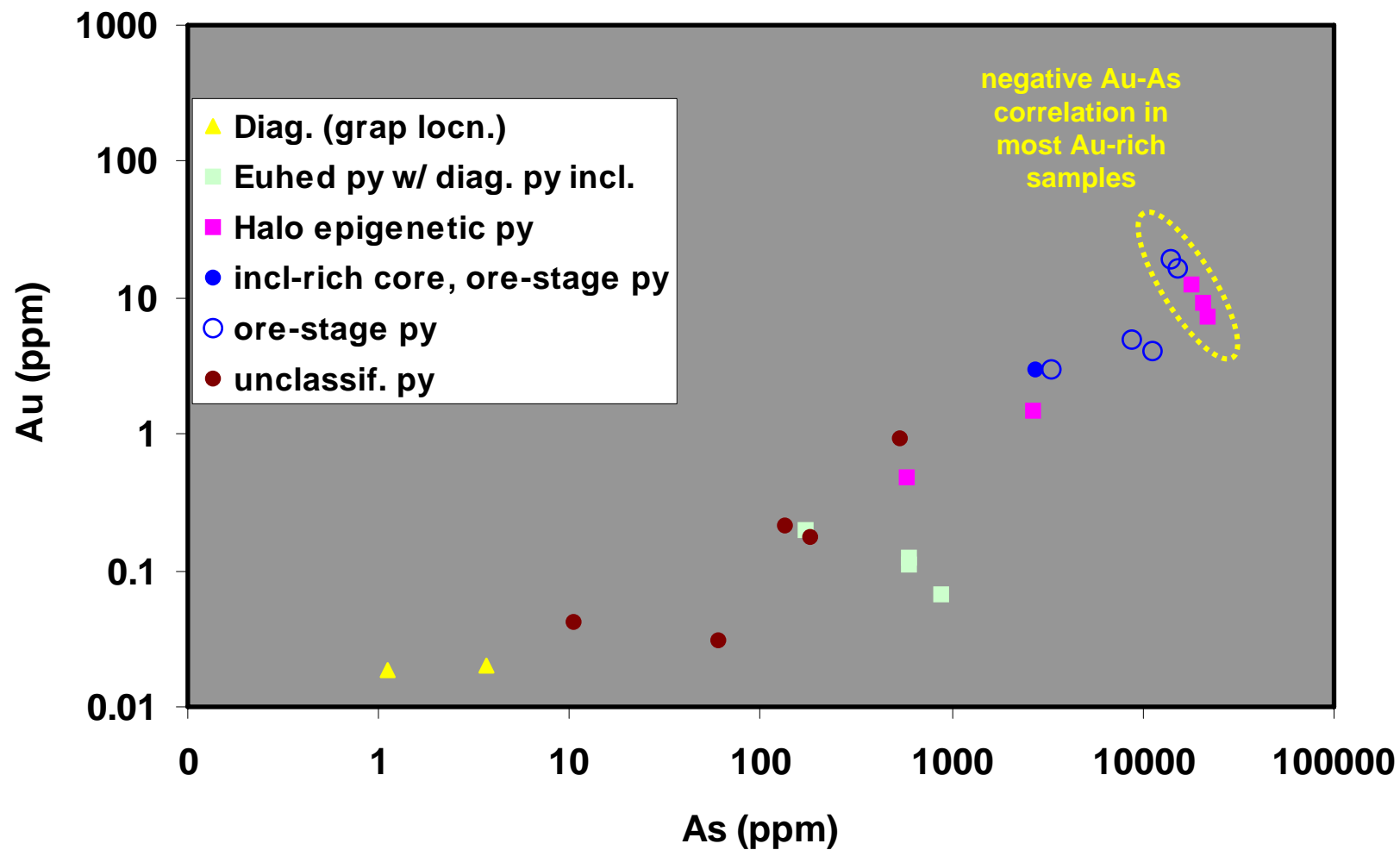
Shale

Tab ChartC:\DATA\060214\FE14A21.D

Tab ChartC:\DATA\060214\FE14A22.D

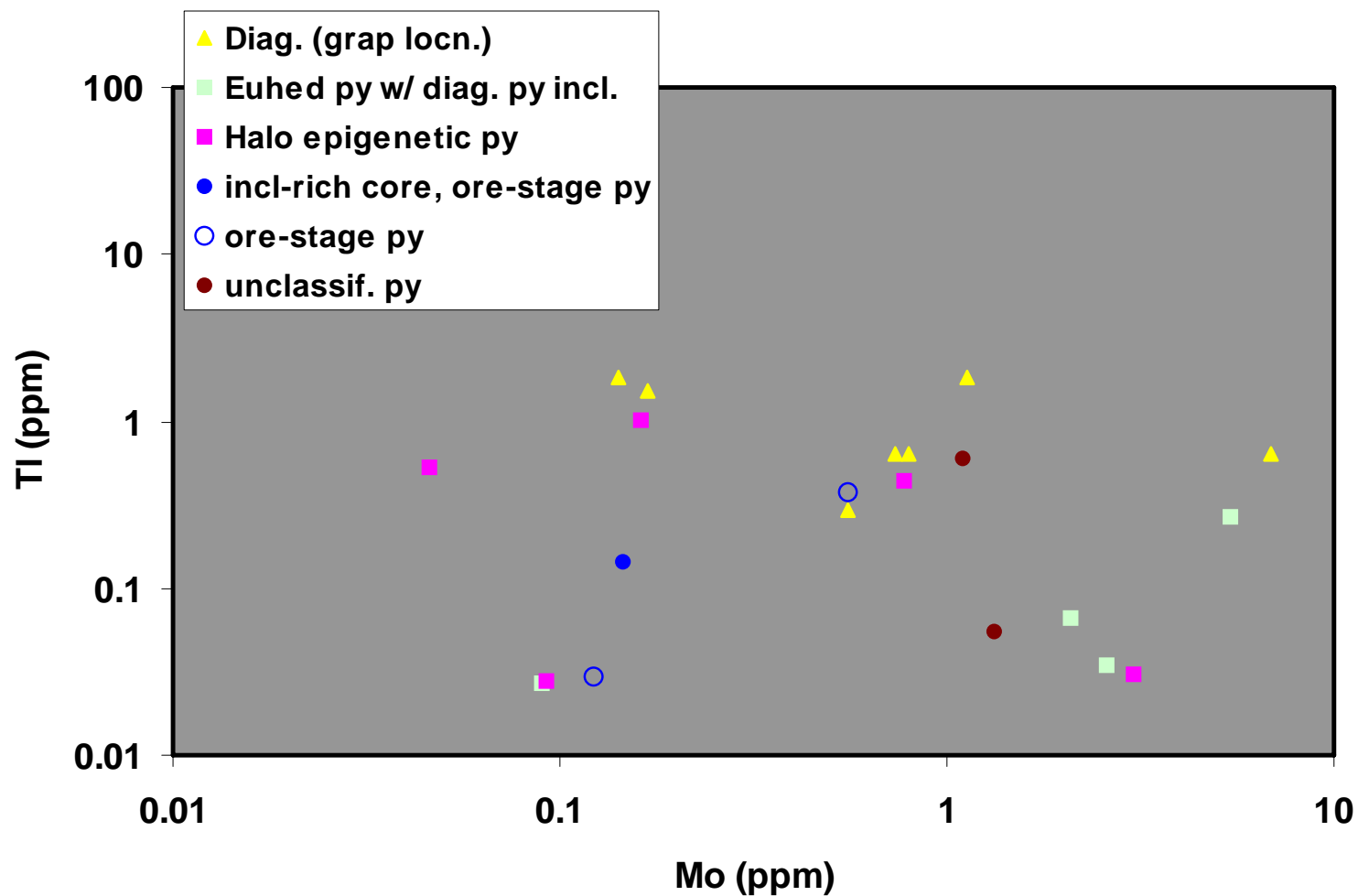


# Au – As, NE Tasmania

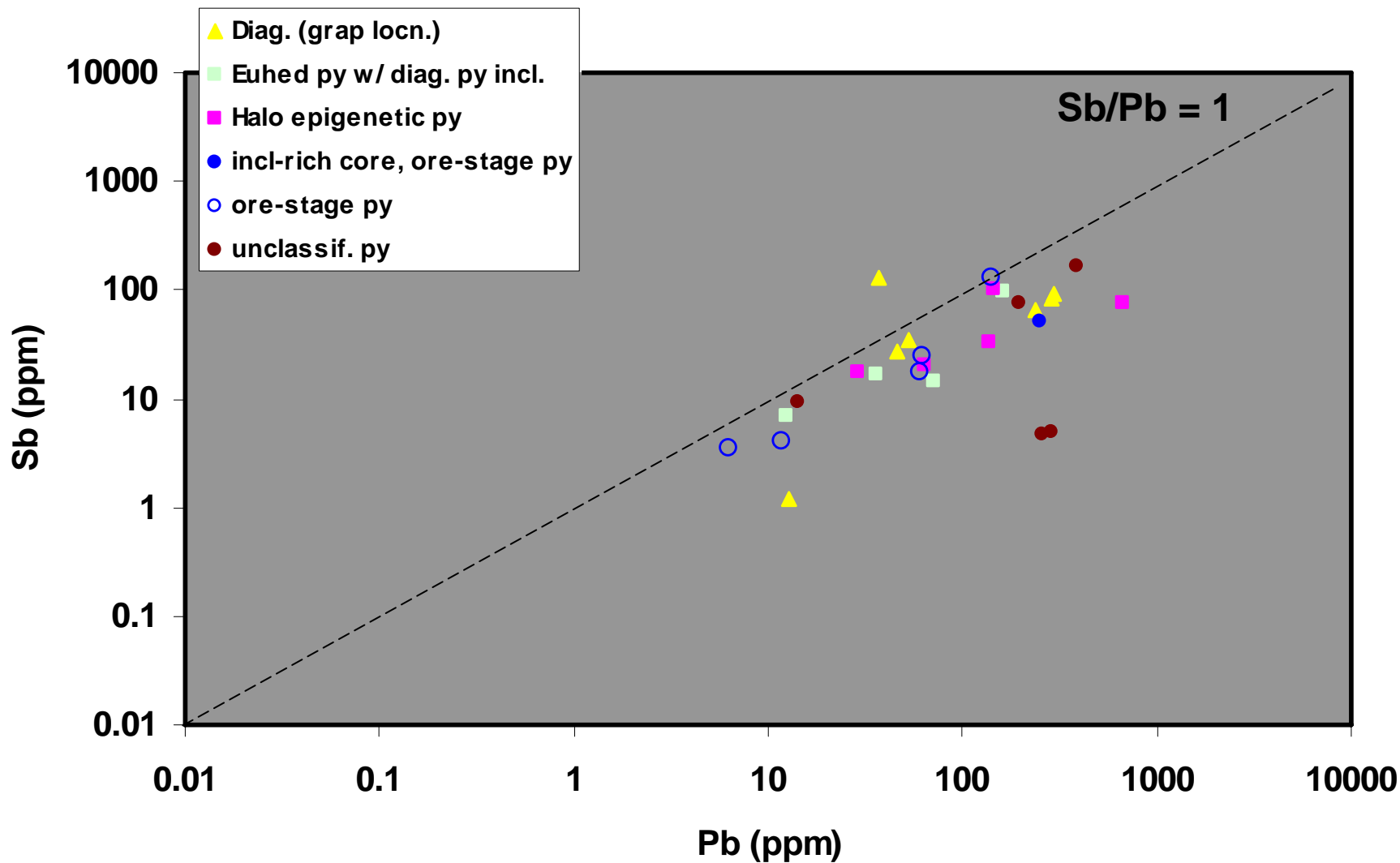




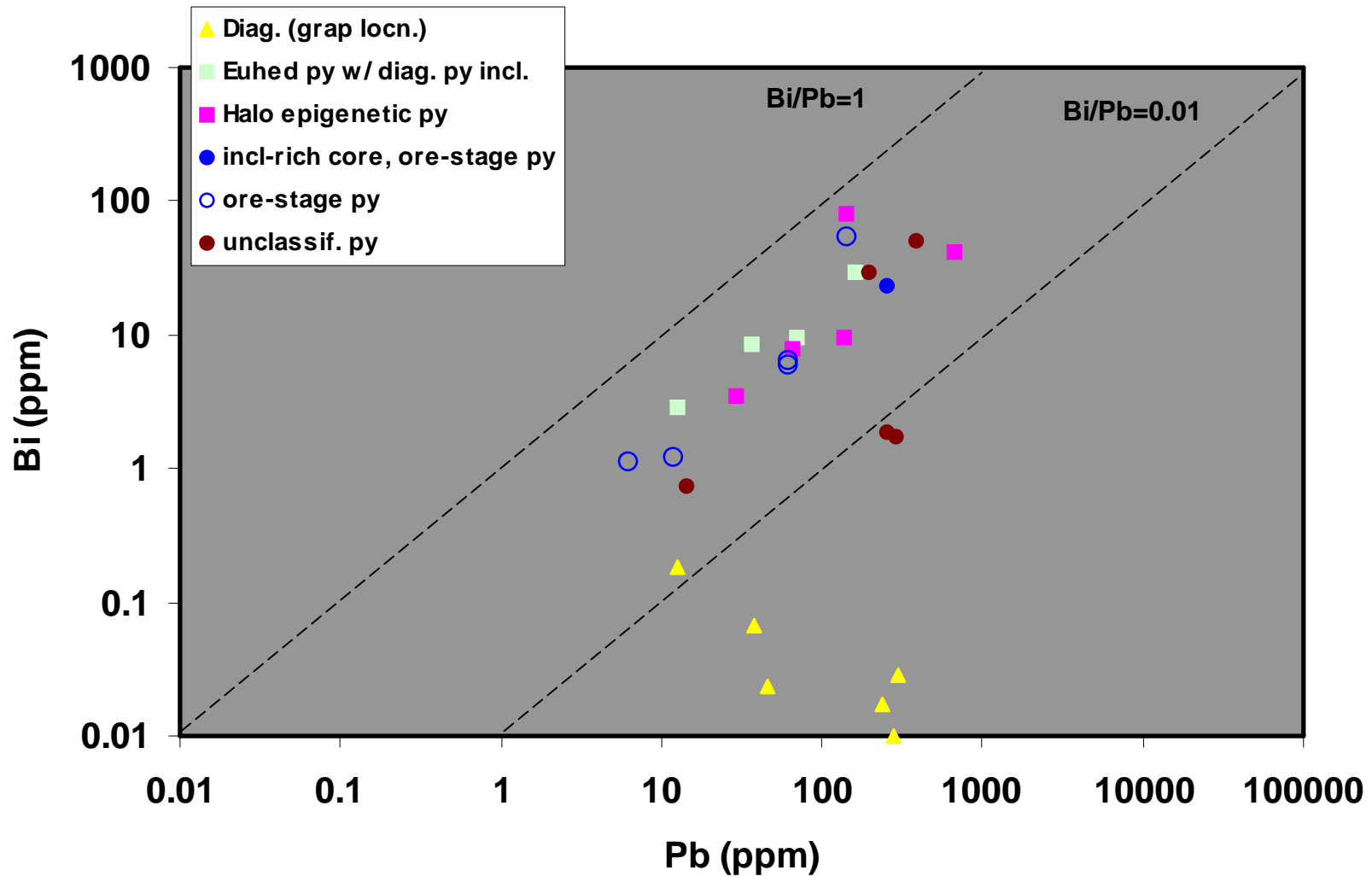
# Mo – Tl, NE Tasmania



# Pb – Sb, NE Tasmania



# Pb – Bi, NE Tasmania





# Conclusions

- **Auriferous py-asp mineralisation at Lefroy is similar in appearance, gross compositional character and probably age to that at Fosterville**
- **Lower Au-tenor of ore-stage pyrite at Lefroy may reflect**
  - Lower concentration of Au in ore fluid
  - Greater (reported) abundance of free-Au at Lefroy
  - Cleaner, less reactive (e.g. Fe-rich) host rocks
- **Halo(?) of auriferous pyrite extends at least 50 m into the hanging wall of Pinafore Reef in drill hole LFD035**
- **Recumbent folds are most likely of Benambran age and a correlation between the Lefroy region and the eastern margin of the Bendigo – Ballarat Zone appears feasible**