

# GOLD MINERALISATION IN THE TASMAN FOLD BELT SYSTEM, NORTHEASTERN QUEENSLAND, AUSTRALIA

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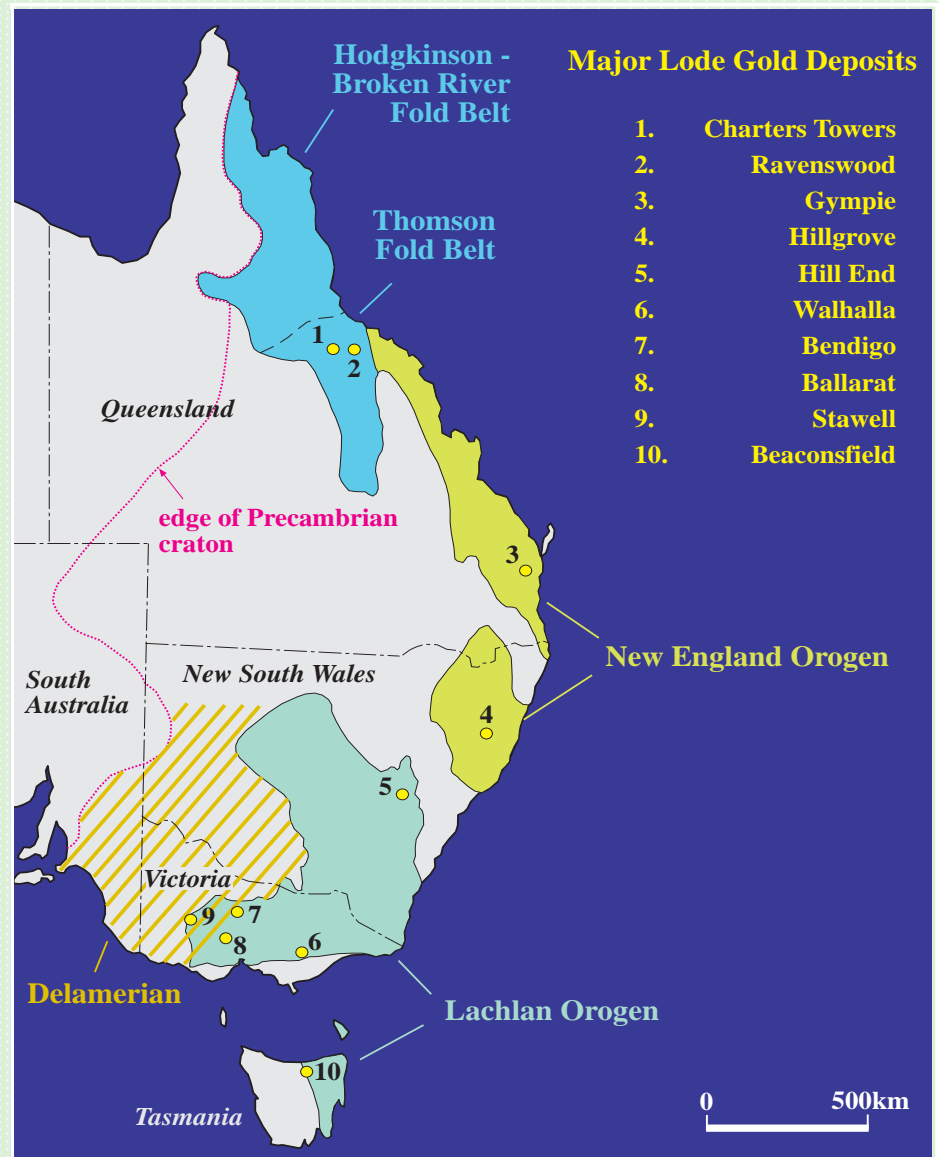
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# Tasminides in Eastern Australia

## Major lode gold deposits

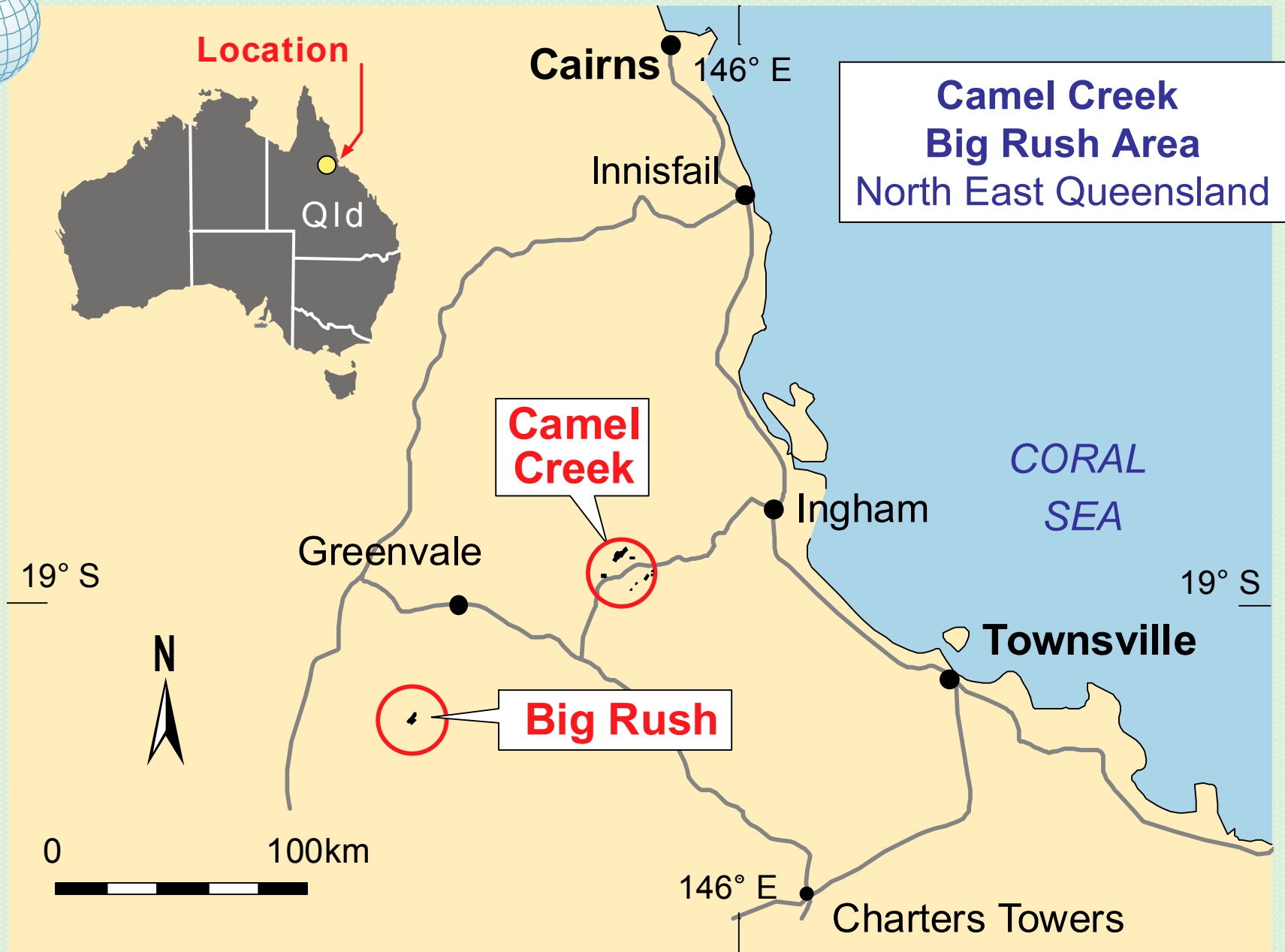
Bierlein & Crowe (2000)





# Central Victoria

- Central Victorian Goldfields have produced 2500 tonnes of gold.
- Deposits occur in quartz-rich turbidites of Cambro-Ordovician (Bendigo-Ballarat Zone) to Early Devonian (Melbourne Zone) age.
- Metamorphic grade ranges from zeolite to greenschist facies.
- The role of carbonaceous sediments is possibly important but debated
- Gold mineralisation is metamorphic related (orogenic) and pre-dates intrusive activity by as much as 80Ma.



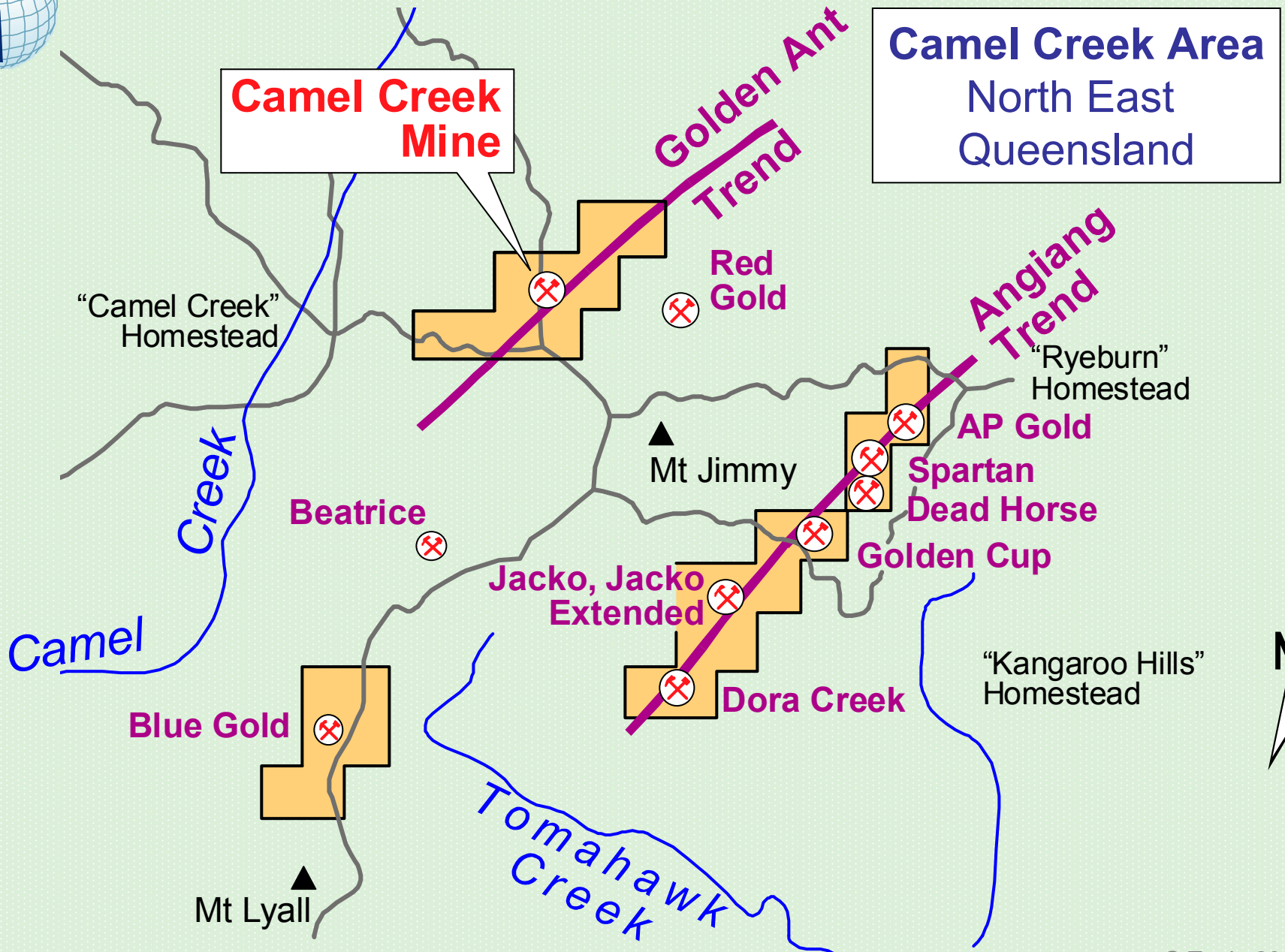


# Broken River Province

- Production of approximately 3 tonnes of gold with little alluvial gold present.
- Deposits and prospects occur in a sequence that ranges from Ordovician to Carboniferous.
- Metamorphic grade ranges from sub-greenschist to greenschist.
- The role of carbonaceous sediments was important.



- Gold mineralisation is orogenic and pre-dates Permo-Carboniferous intrusive activity (eg mineralisation can be contact metamorphosed).
- Pyrite, arsenopyrite, stibnite and trace to rare gold, aurostibite, chalcopyrite, berthierite, tetrahedrite, boulangerite, galena and sphalerite.
- Dominant gangue phases in high grade “reefs” are quartz, carbonate and lesser white mica and chlorite.



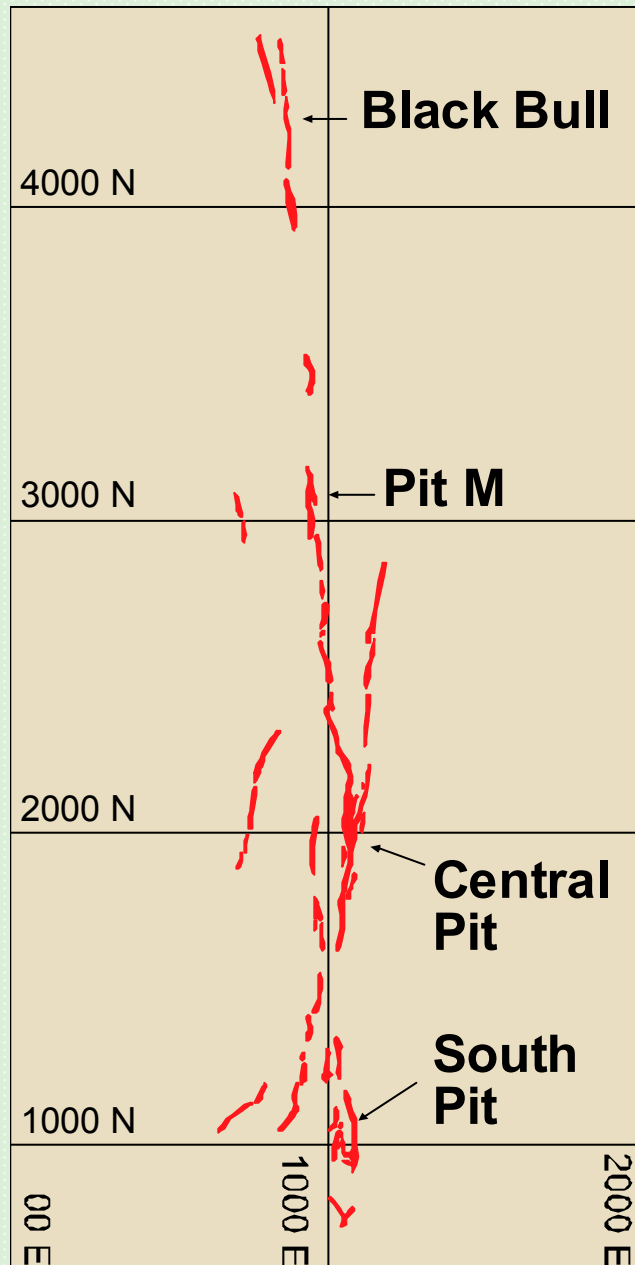




## Reserve drilling at the Blue Gold prospect, Amanda Bel Goldfield, 1988







0 1000  
metres

**Camel Creek Area  
North East Queensland  
Mining Zones**



## Melange in South Pit, Camel Creek Mine



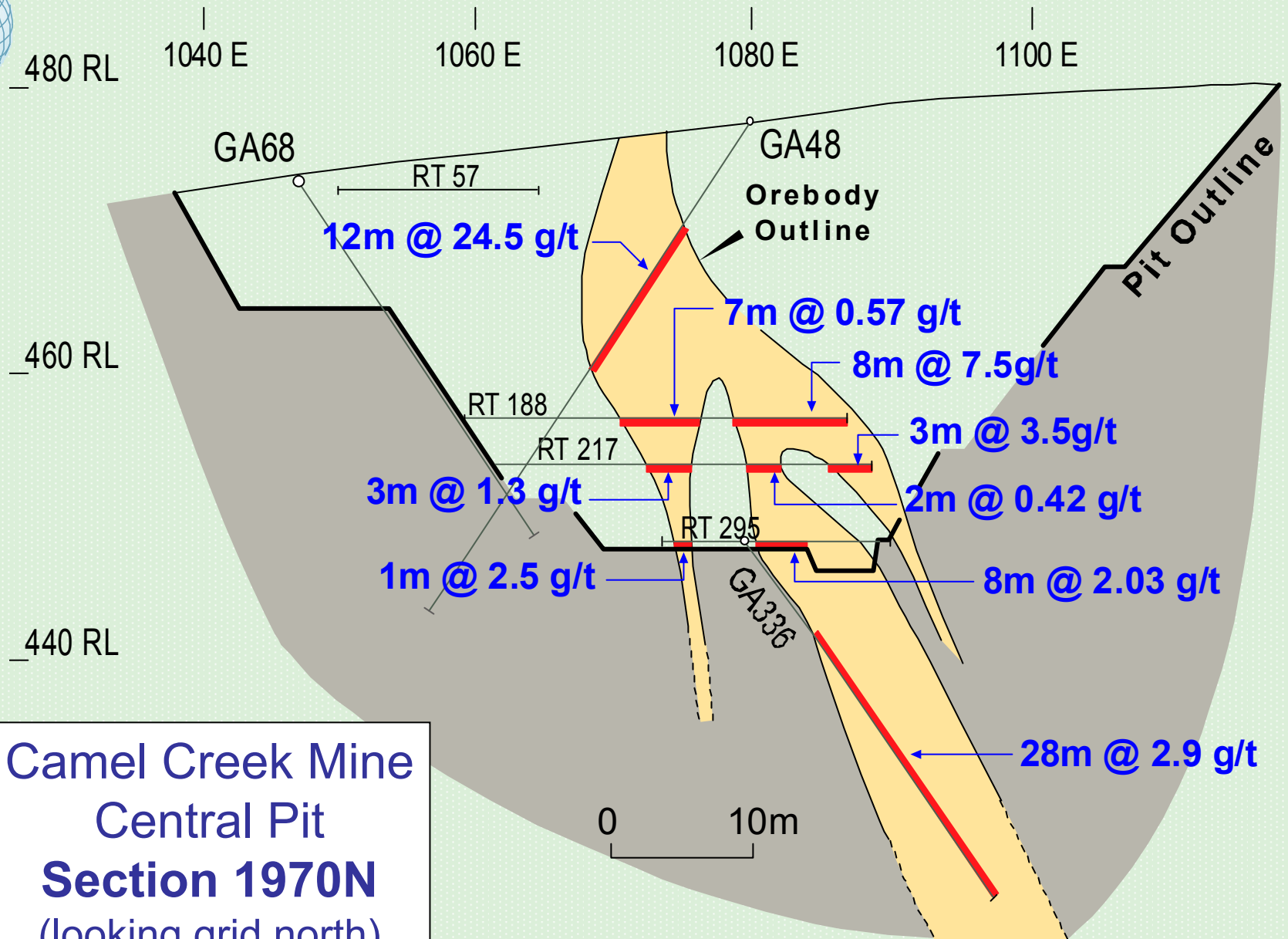




## Transposed and boudinaged greywacke beds in carbonaceous shales, Camel Creek Mine



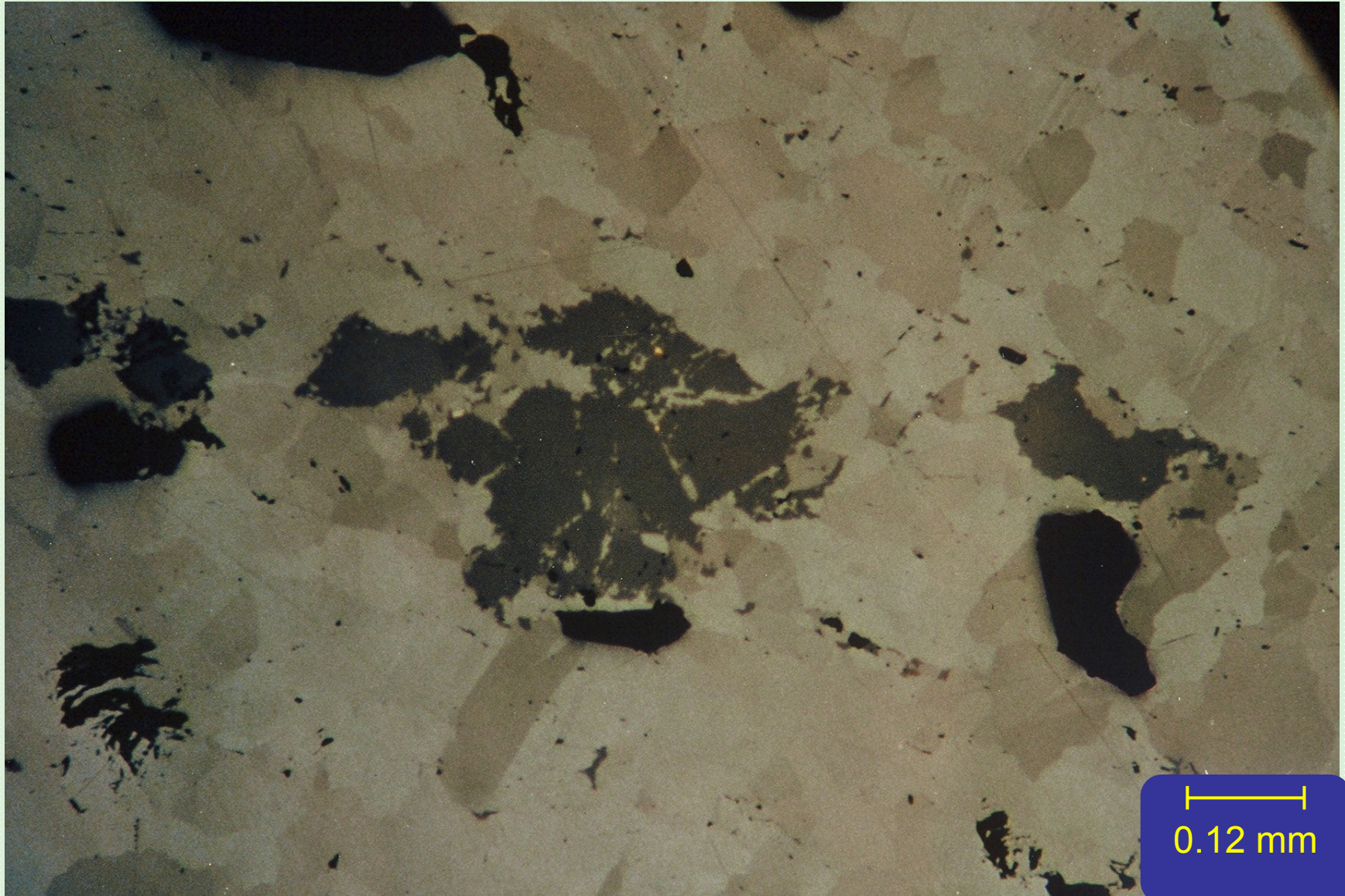








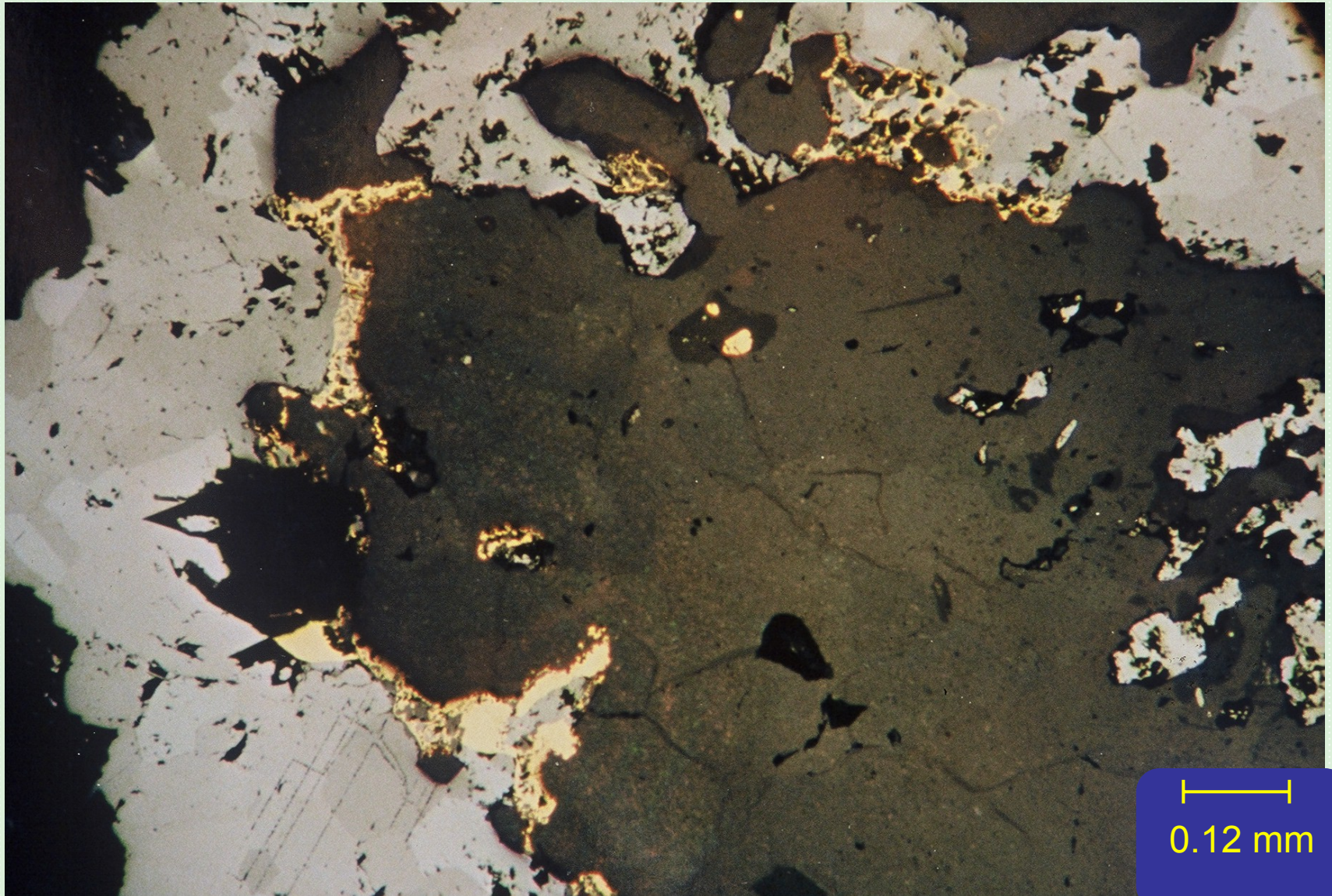
## Free gold associated with sphalerite in massive stibnite







## Gold developing after aurostibite and enclosing quartz gangue

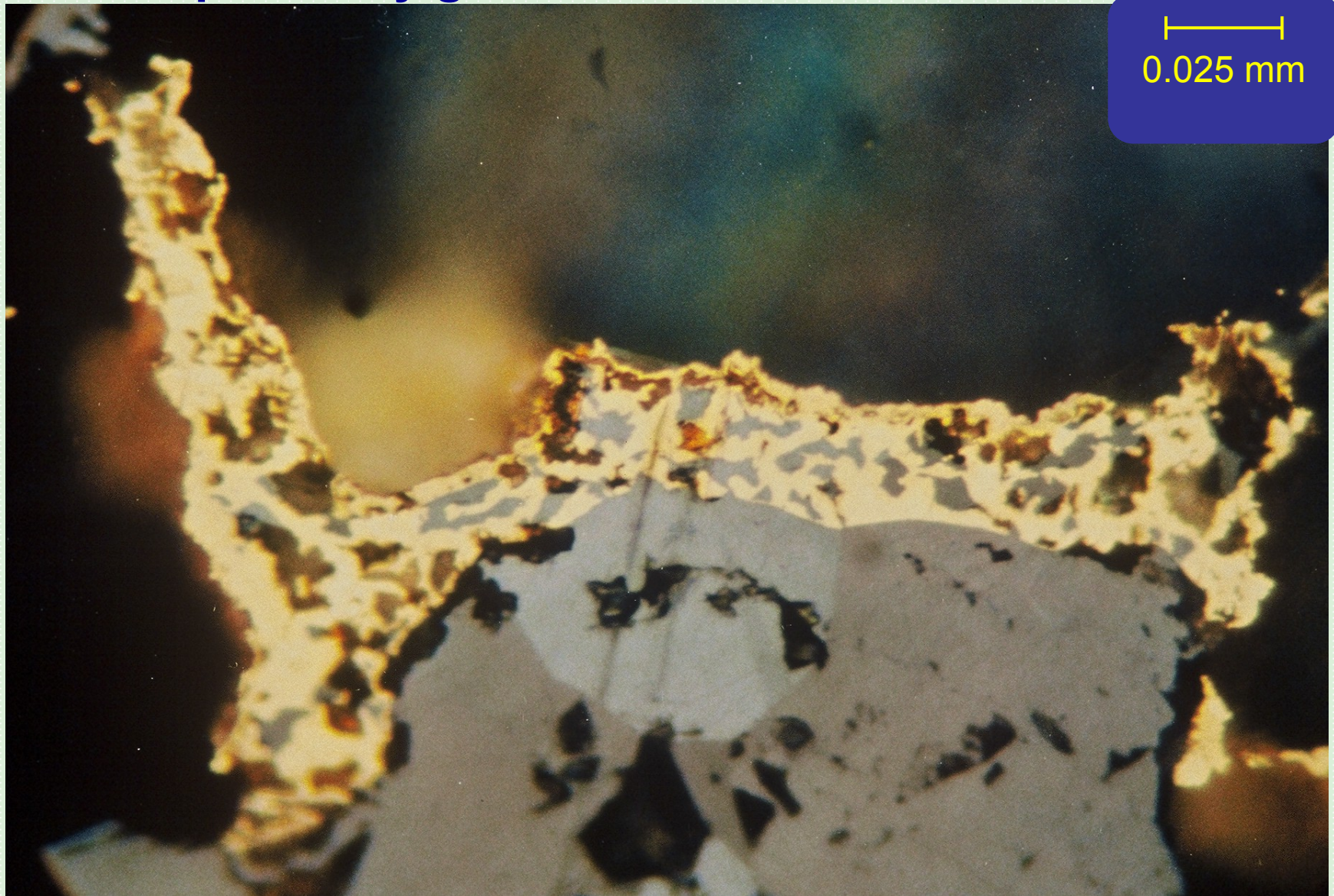


0.12 mm





**Closer view of previous slide. Aurostibite is being replaced by gold + stibnite  $\pm$  native antimony.**

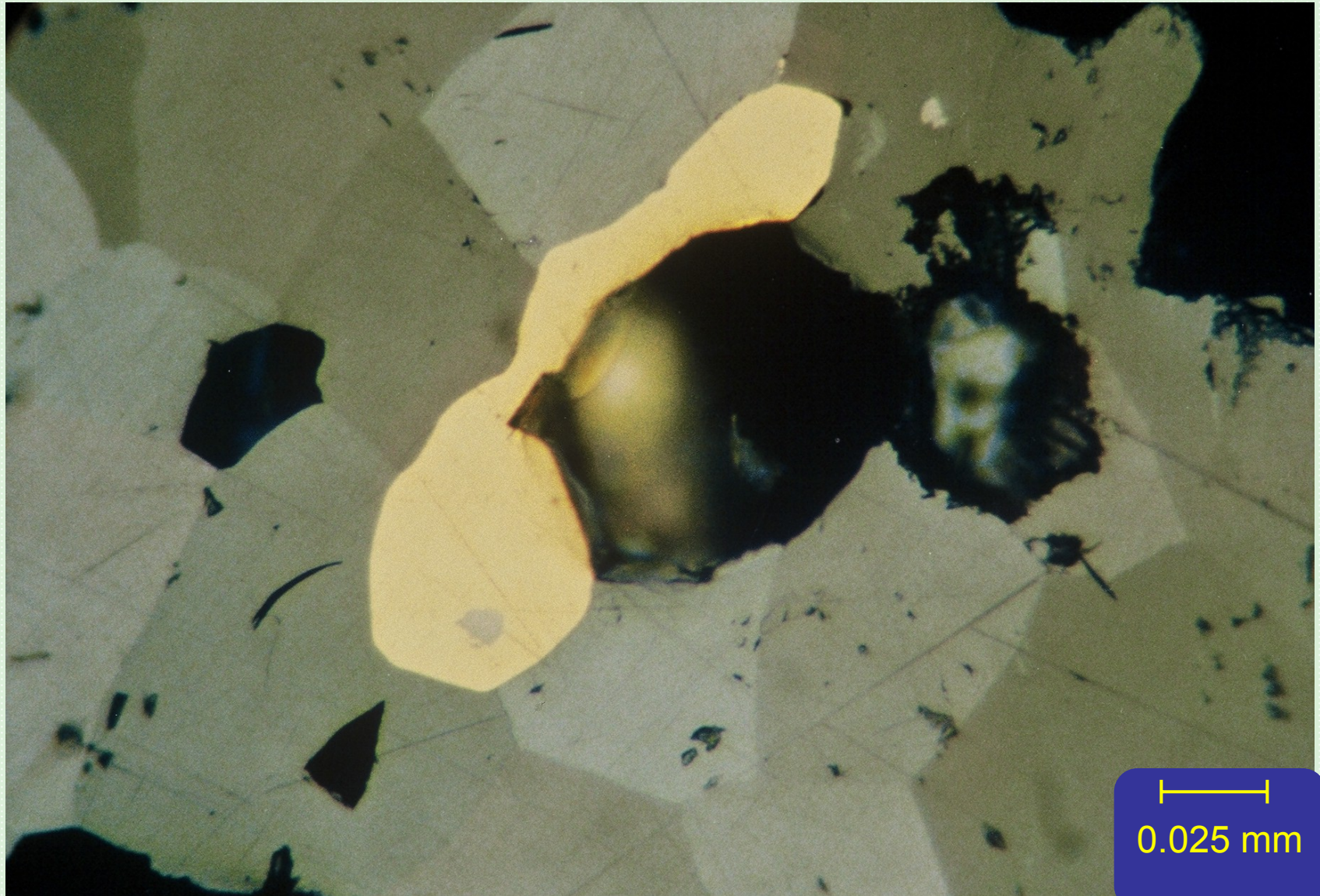


0.025 mm





**Gold in textural equilibrium with stibnite.  
Stibnite adjacent to the gold grain contains 0.7% Au.**





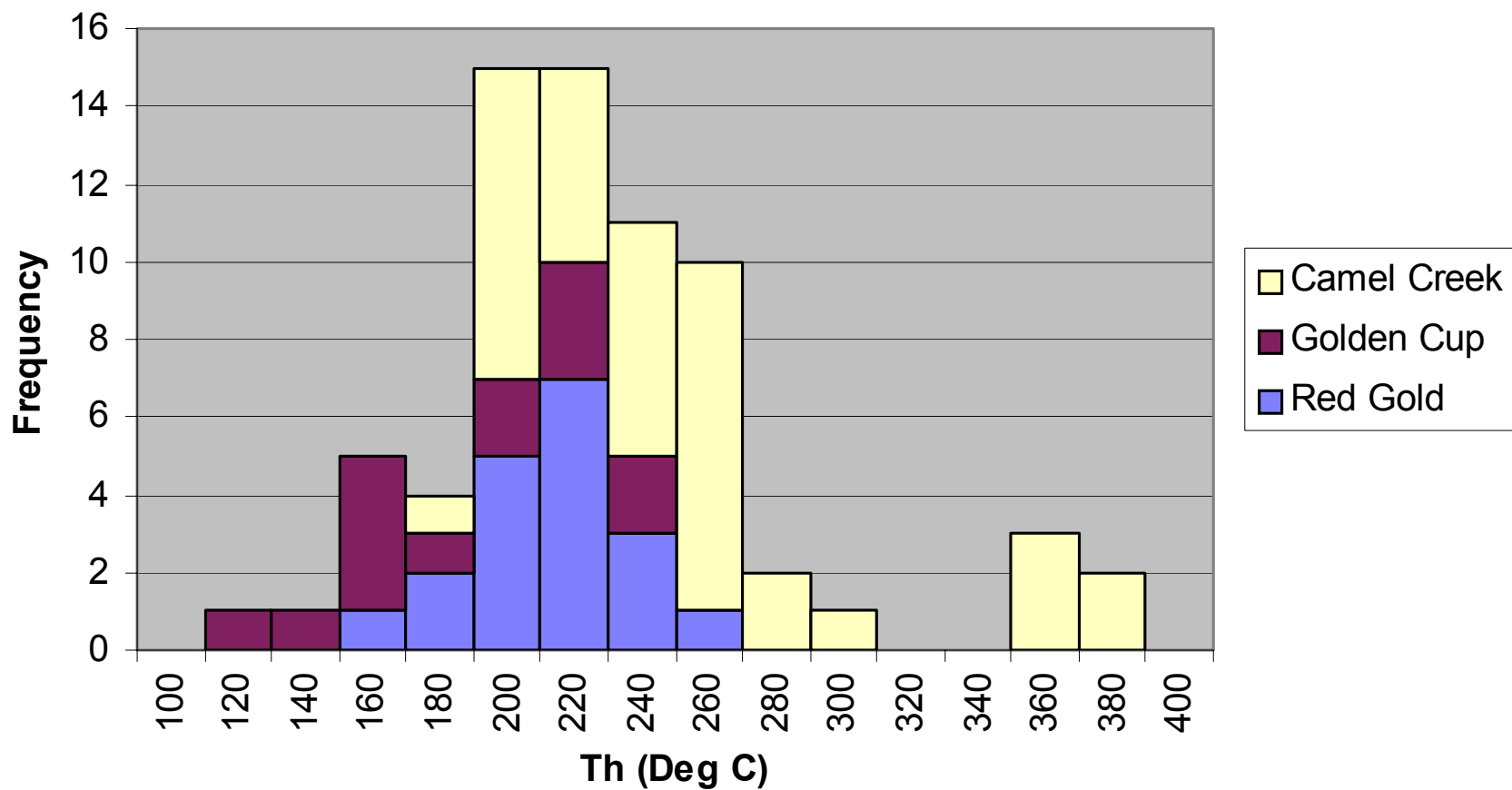


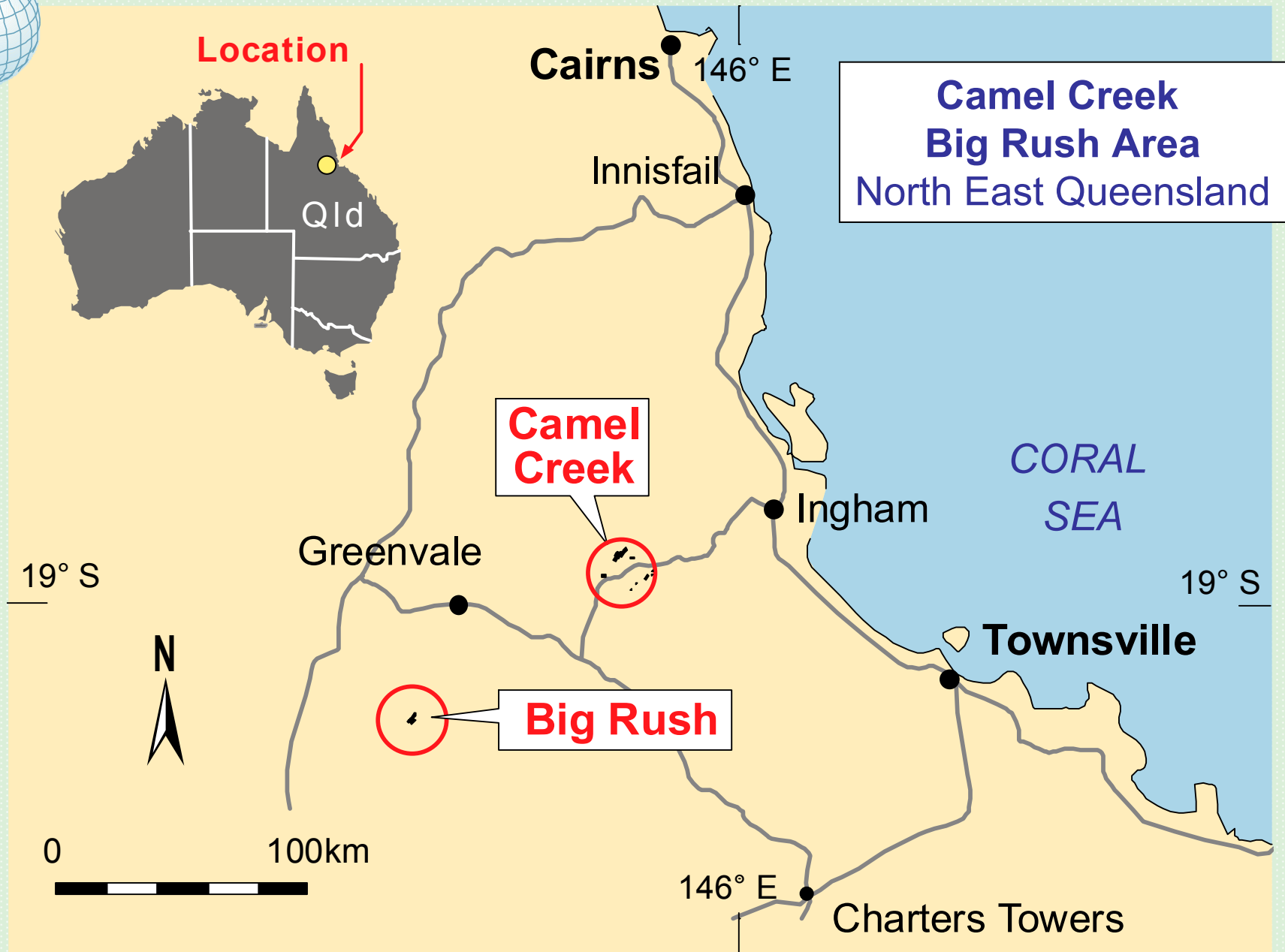
# Fluid Inclusion Study

- The simple two phase liquid-vapour nature of the inclusions and the absence of gaseous phases like carbon dioxide or methane suggest that water was the main fluid constituent.
- No evidence of boiling which could be related to ore deposition was recorded.
- Fluid salinities between 2 and 5 wt% NaCl equivalent.
- Homogenisation temperatures suggest minimum fluid trapping temperatures between 160°C and 300°C.
- The inclusions are typical of orogenic gold deposits (lower T end) and have similar salinities, pressures and compositions.



## Homogenisation T Amanda Bel Goldfield





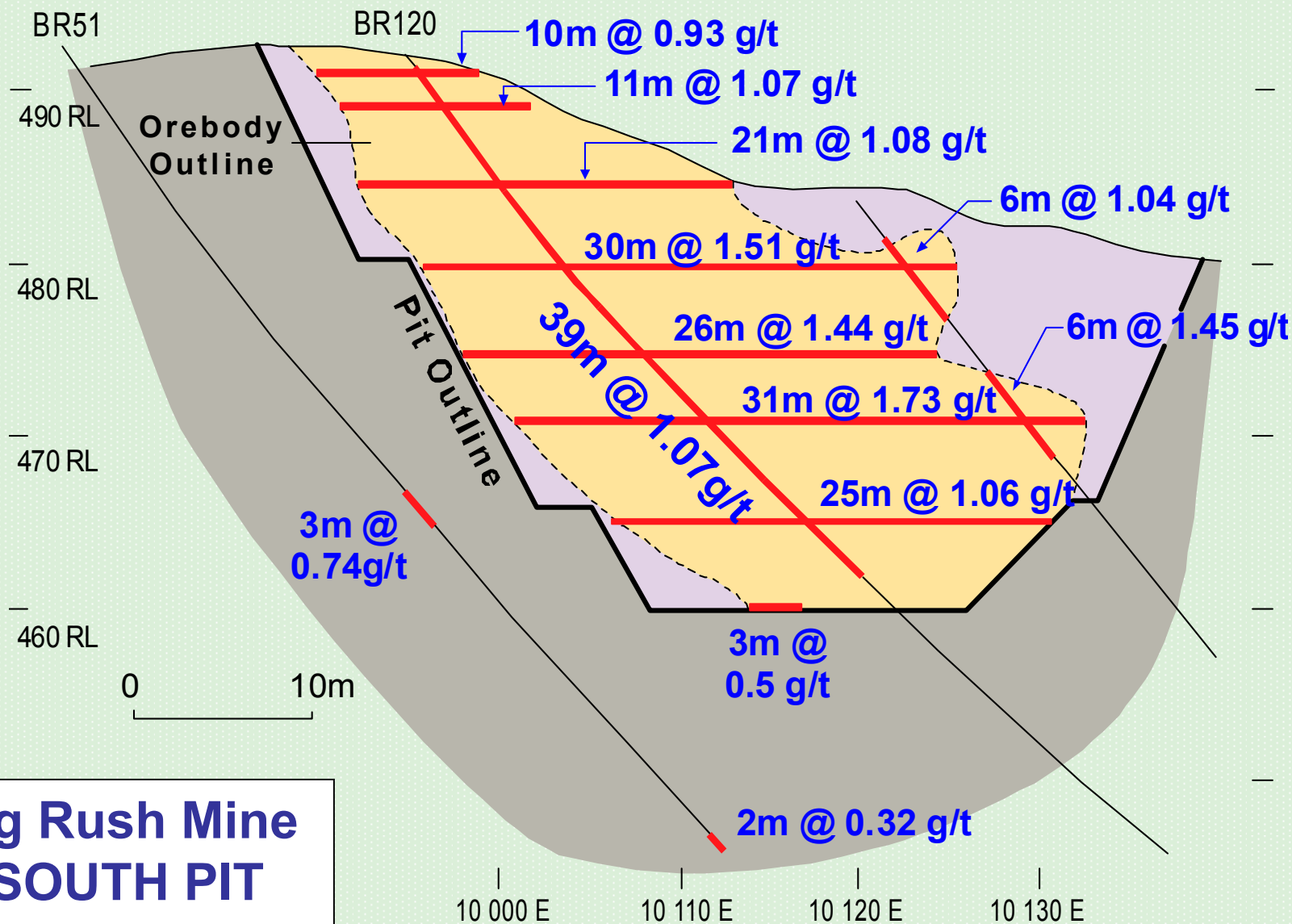


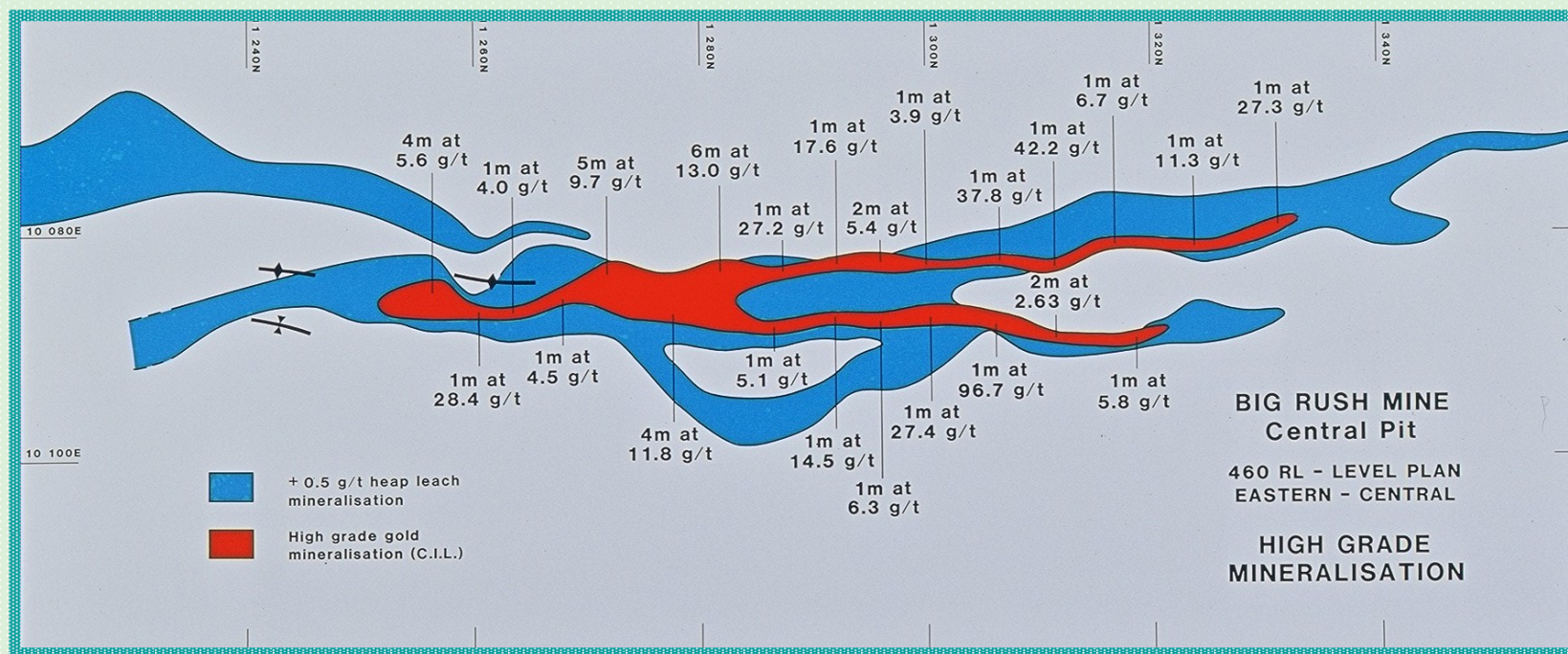


# Central Pit area at Big Rush during a pit blast.



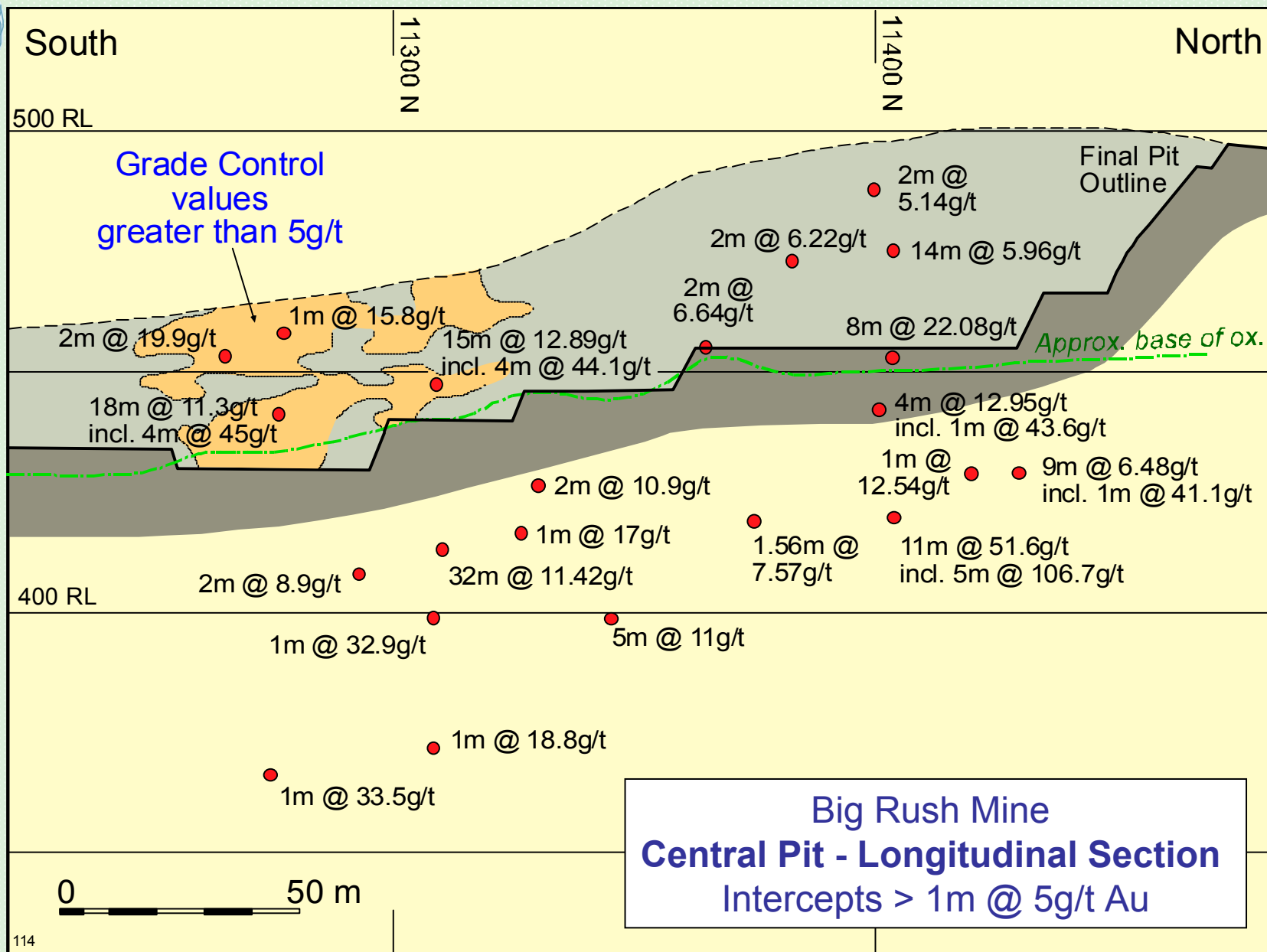






**460RL Level plan showing high grade mineralisation  
and enclosing arsenopyrite-rich halo**







# Controls on Mineralisation, Big Rush Deposit

1. Presence of highly carbonaceous (including graphite), pyritic and calcareous shales.
2. Presence of “tuffaceous” sandstones intercalated with carbonaceous shales. These act as conduits for mineralising fluids.
3. Structural control on mineralisation of strong axial planar cleavage ( $020^{\circ}$ - $030^{\circ}$ ) developed in tight parasitic folds in black shales (axial planar reefs and veins, disrupted saddles) and/or open folds in greywacke/sandstone units (saddle reefs, 3-dimensional quartz-sulphide stockworks).





4. Slightly oblique shears and fault structures cutting the main mineralised package.
5. Plunge variation of folds on the local scale in conjunction with a mild “warping” of the fold structure.
6. Intersection of subtle  $110^\circ$  structures with the main Big Rush trend appears to cause “blow-outs” in the mineralisation.



# Wallrock Alteration

- Development of ankerite, sericite, quartz and arsenopyrite in carbonaceous shales.
- This alteration domain can contain 0.5ppm to 1ppm gold.
- Forms a significant proportion of oxidised heap leach ore.
- Arsenopyrite  $\rightarrow$  scorodite ( $\text{FeAsO}_4 \cdot 2\text{H}_2\text{O}$ )  $\rightarrow$  hydrated iron oxides; gold released and is amenable to cyanide leaching.





# Mineral Chemistry

- Wide range of chlorite and carbonate compositions from deposit to deposit and within each deposit.
- Gold generally contains ~10% Ag.
- Arsenopyrite can contain from below detection gold to 1.5% gold.
- Stibnite can contain up to 0.7% gold.

# Any questions?

