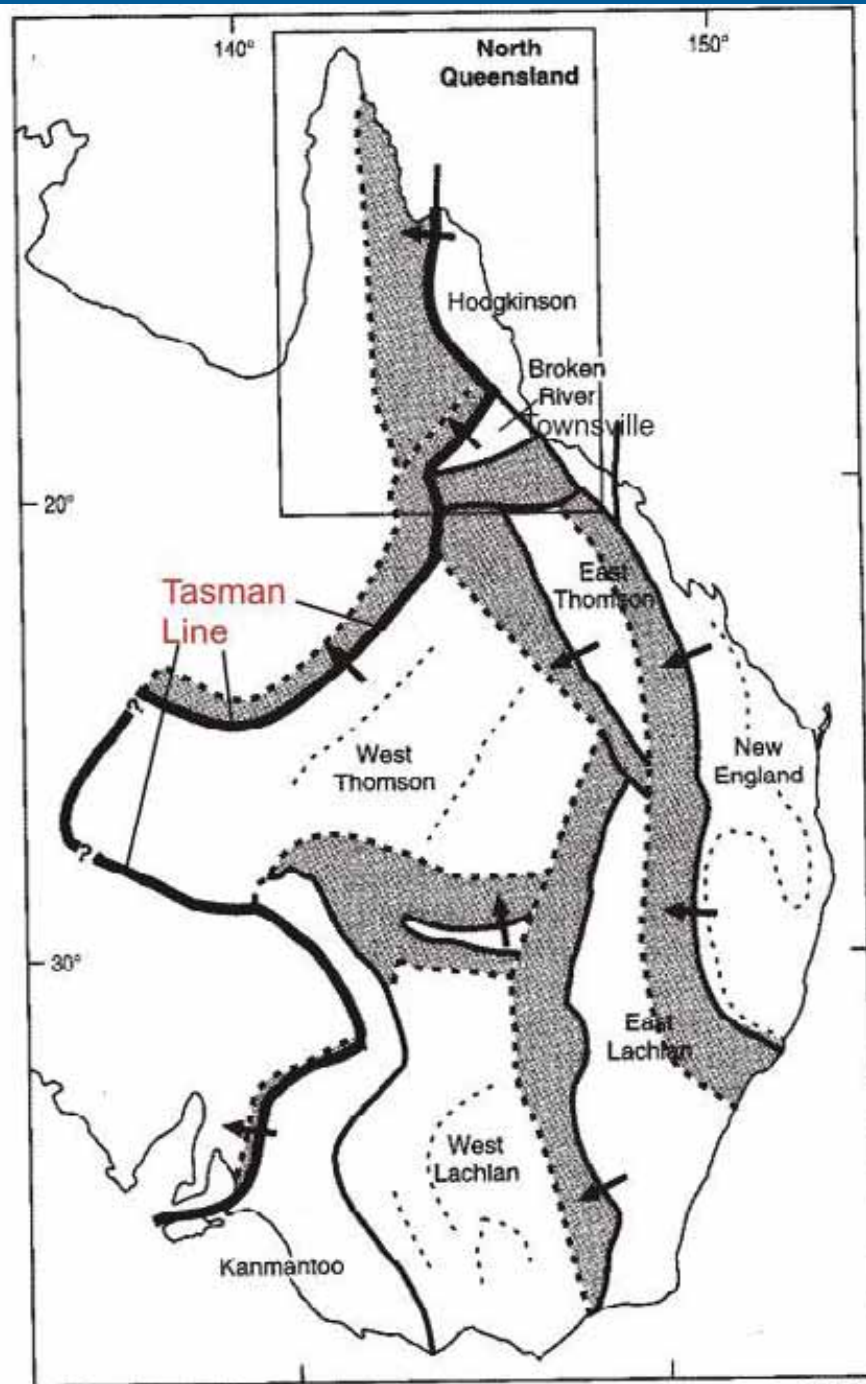
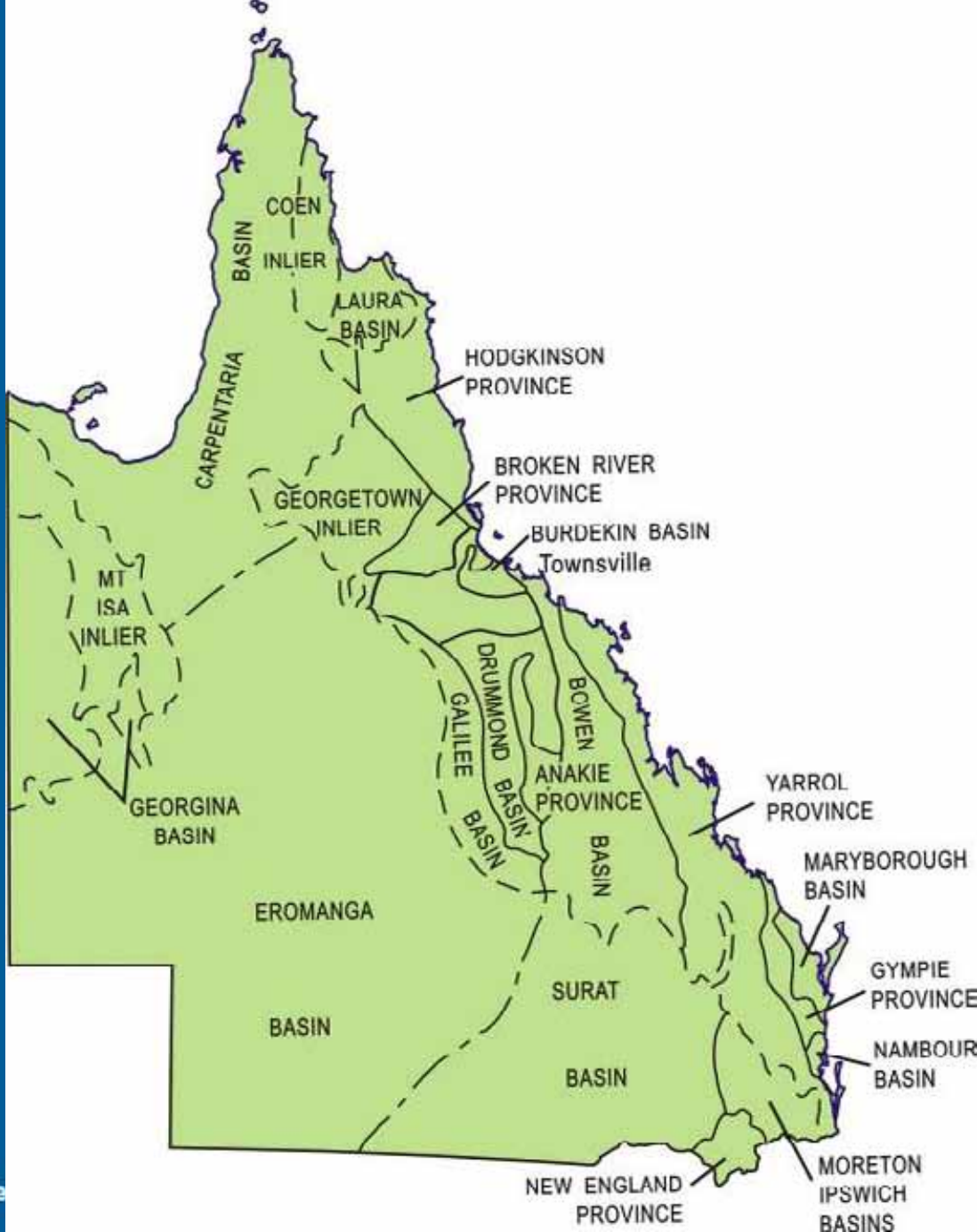


Depositional Systems, Crustal Structure and Mineralisation in the Thalanga Province, North Queensland

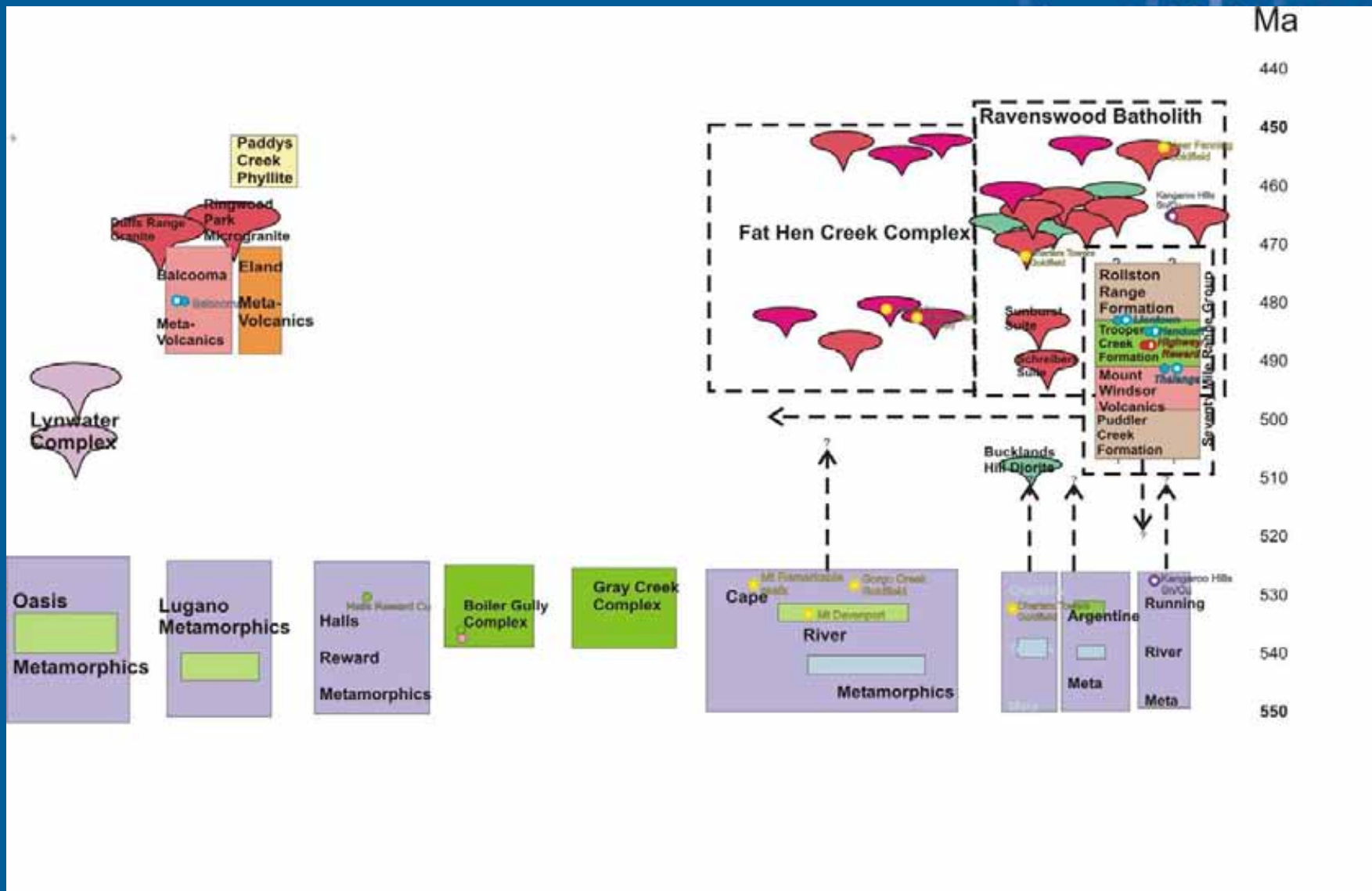
L.J.Hutton & I W Withnall
Geological Survey of Queensland





Thomson Fold Belt

- Late Neoproterozoic to Middle Ordovician volcanic and sedimentary rocks occur throughout the Thomson Belt in Queensland
- Detrital zircon peaks at ~1100-1300Ma, 800-900 Ma and some at 500-600Ma
- Late Cambrian to Middle Ordovician units include Seventy Mile Range Group, Balcooma Metavolcanics, granites in the Ravenswood Batholith and the Fat Hen Creek Complex.



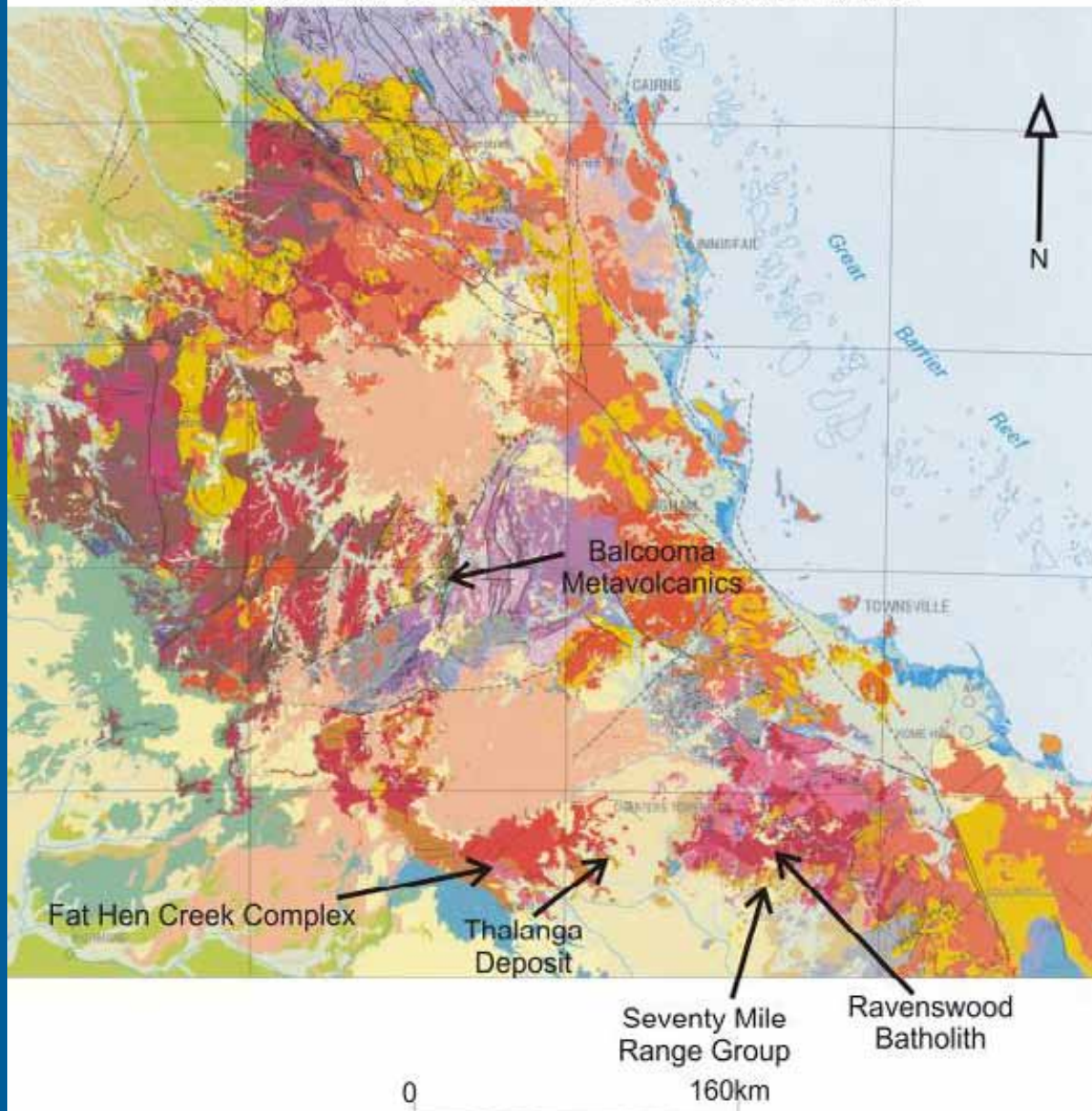
Late Neoproterozoic to Early Cambrian

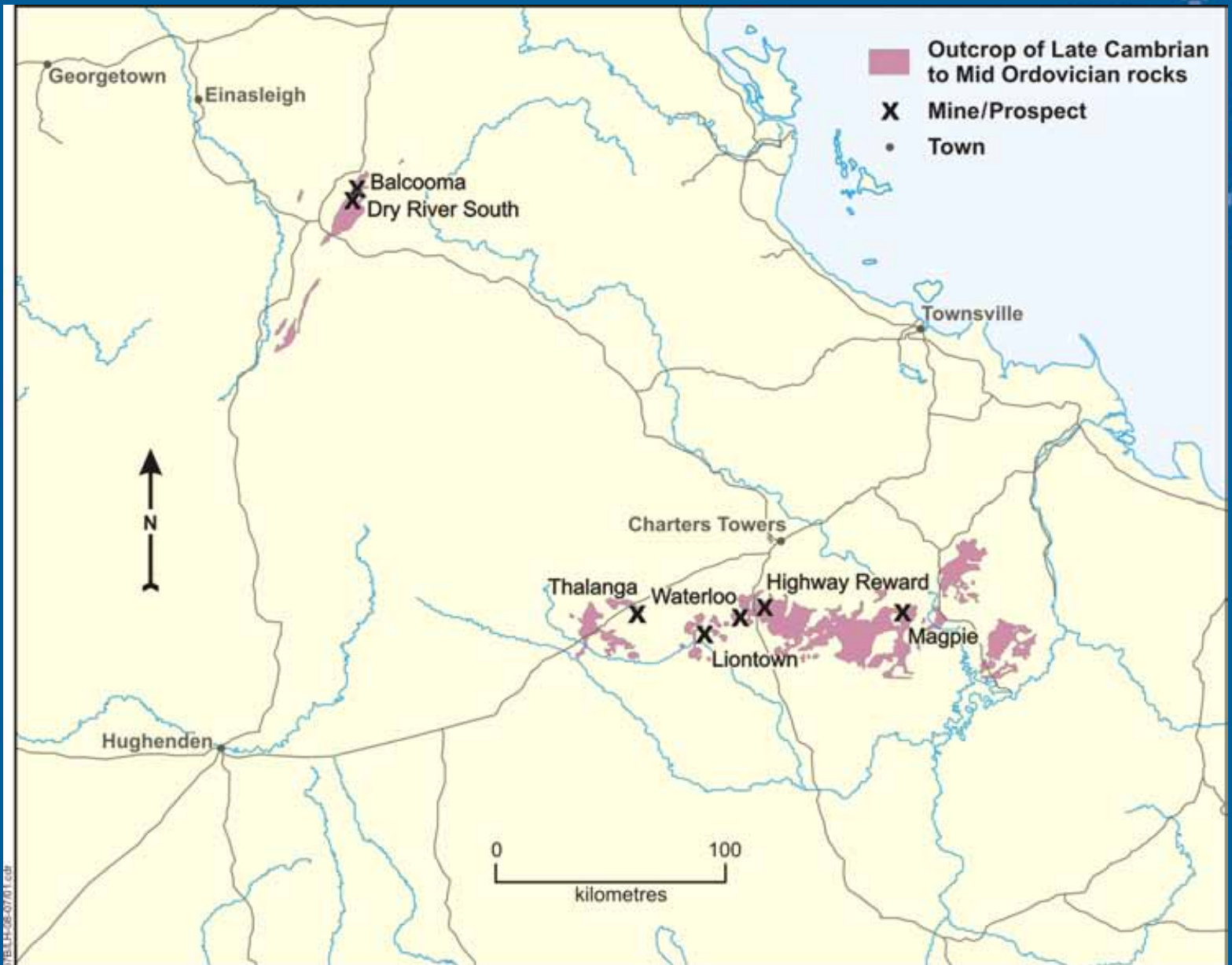
- Late Neoproterozoic to Early Cambrian sediment may be deposited on a passive margin outboard of Eastern Gondwana
- Some interpret a “superfan” generated during the collision of east and west Gondwana, extending across several continents

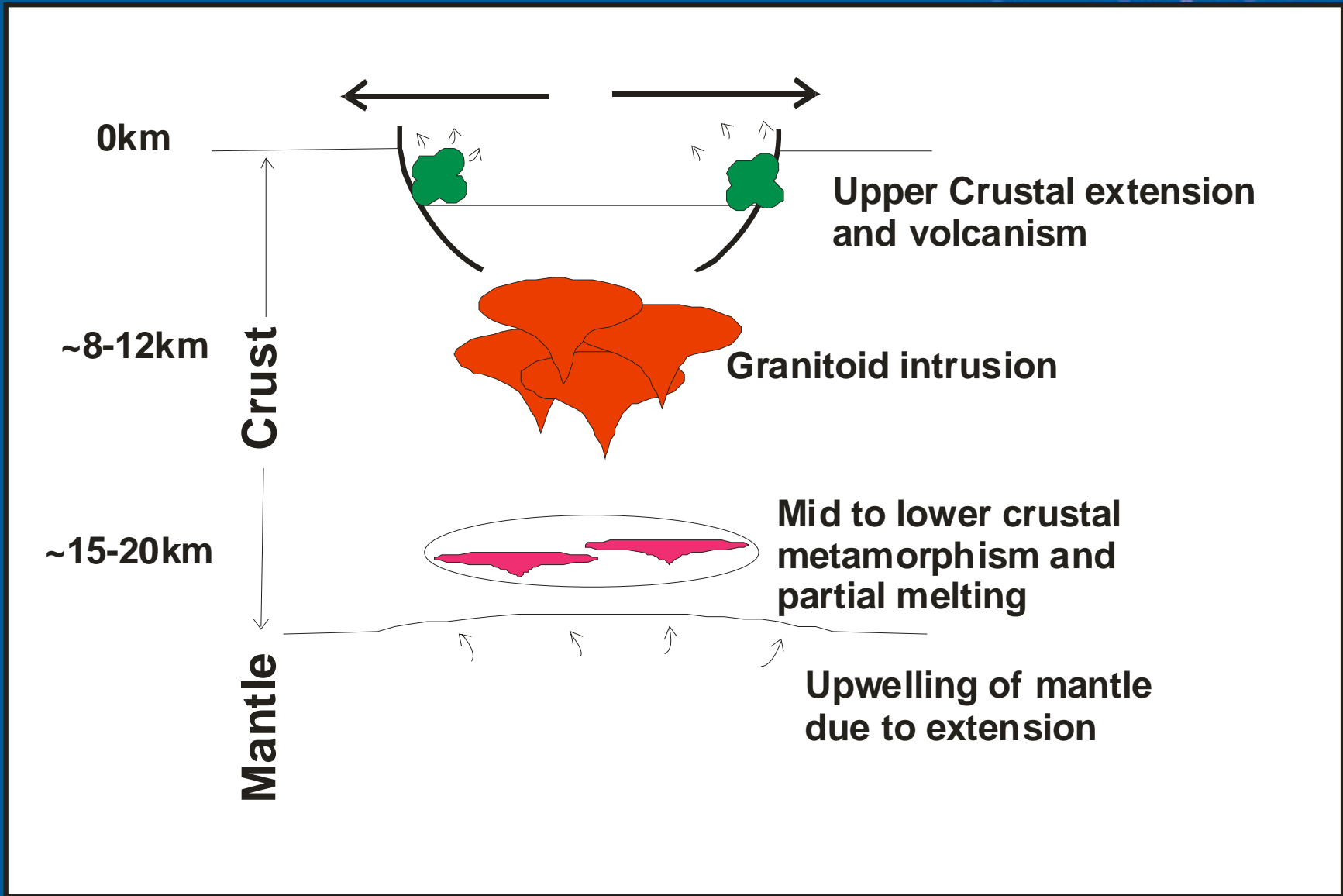
Late Cambrian to Early Ordovician

- In the Cape River area, Late Cambrian to Early Ordovician sedimentary rocks and volcanics are interpreted to have formed in a back arc, inboard of a west-dipping subduction zone
- Granitoids of the same age intrude into the Ravenswood Batholith
- Metamorphism of this same age in the same area must have occurred at deeper levels in the same system

GEOLOGICAL MAP OF TOWNSVILLE-CAIRNS HINTERLAND

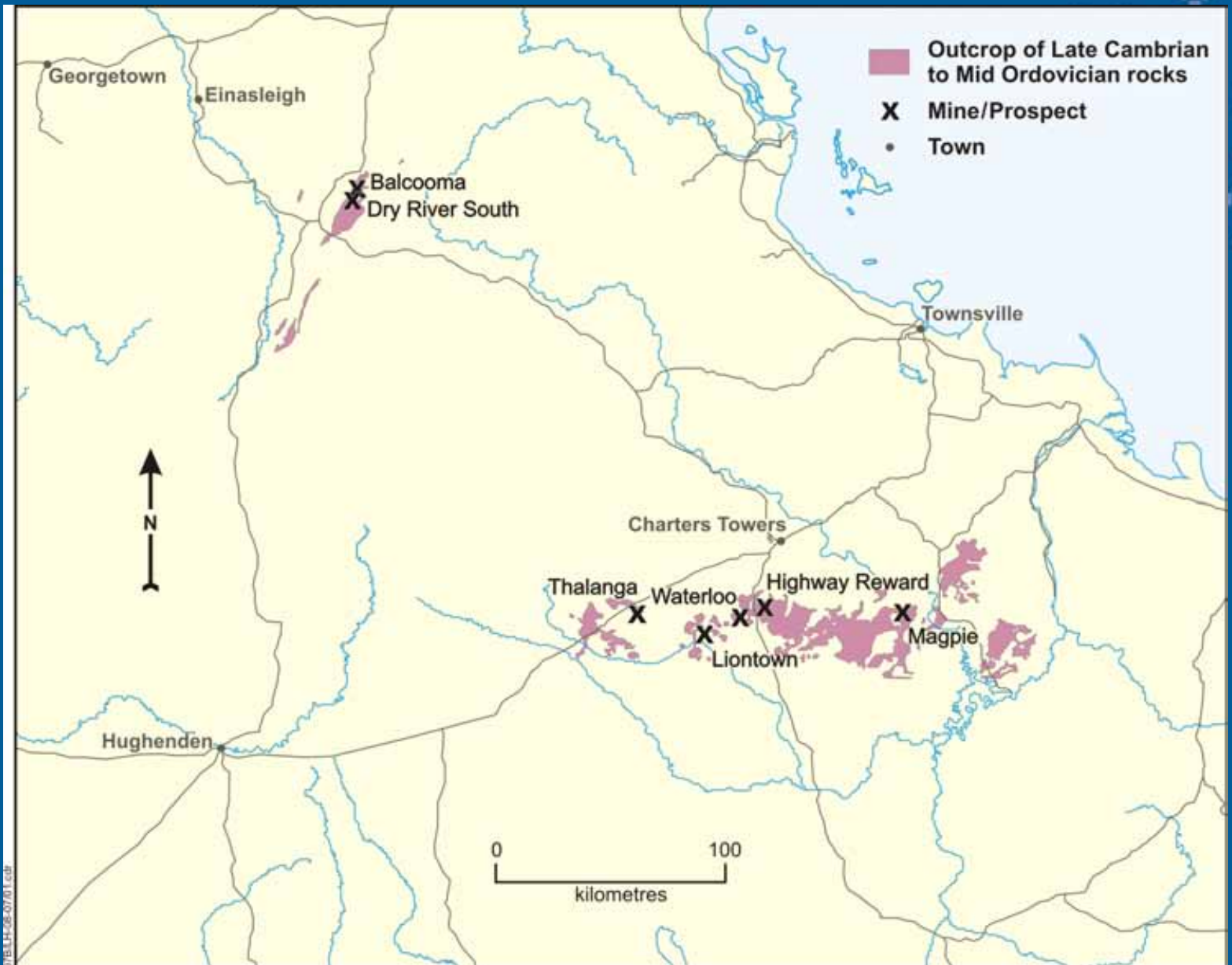






Setting of Late Cambrian to Early Ordovician sequences

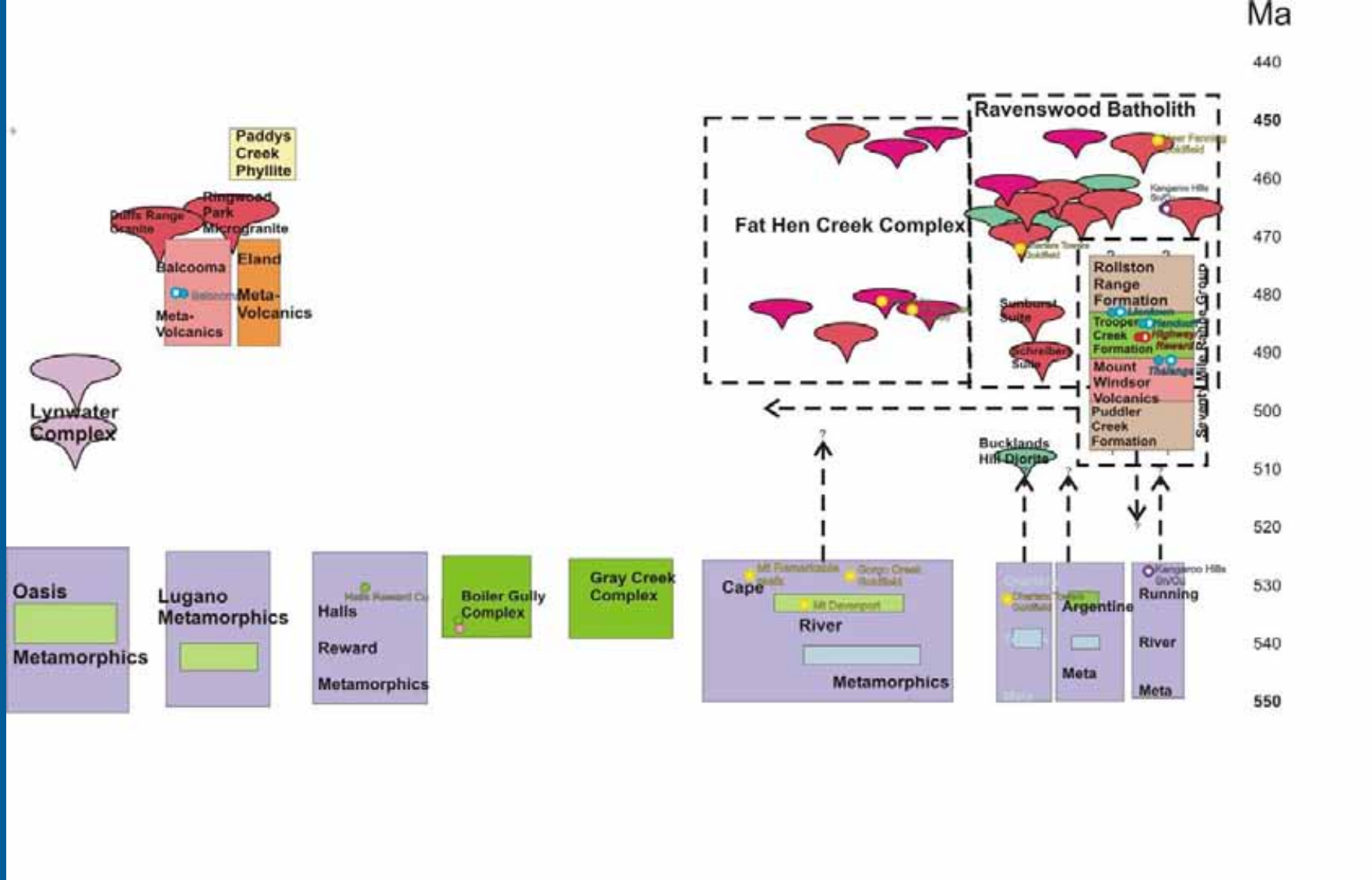
- No volcanic arc of this age known in North Queensland, but the Seventy Mile Range Group interpreted as being deposited in a back-arc setting
- There is evidence for grabens and thickness changes in volcanic units
- Ordovician volcanic arcs are interpreted from NSW
- The Cambrian to Mid Ordovician in north Qld interpreted as a time of extension (Fergusson & others)
- Cambrian to Mid Ordovician deep crustal metamorphism interpreted to have formed in extensional environment



Deposit	Tonnage of ore	Pb	Zn	Cu	Au	Ag
Thalanga	6.35Mt	3.9%	12.3%	2.2%		99g/t
Liontown	1.8Mt	2.2%	6.16%	0.48%	0.9g/t	29g/t
Handcuff	1Mt	0.2%	7.4%	0.4%	0.2g/t	8.8g/t
Waterloo	372,000t	2.8%	19.7%	3.38%	2g/t	94g/t
Highway/ Reward	3.7Mt	minor	minor	5.6%	0.25g/t	minor
Balcooma, Surveyor 1, Dry River (Polymetallic ore)	3.877Mt	3.9%	8.94%	1.1%	0.74g/t	81g/t
Balcooma, Surveyor 1, Dry River (Copper ore)	2.342Mt	0.14%	0.34%	3.44%	0.44g/t	18g/t

Ma

440
450
460
470
480
490
500
510
520
530
540
550



Thalanga Deposit

- Occurs at the contact between rhyolite of the Mount Windsor Volcanics and dacite to andesite of the Trooper Creek Formation
- Commodities include lead, zinc, copper and silver
- Stratiform tabular geometry underlain by disseminated stringer mineralisation and stockworks
- Typical of VHMS deposits from back-arc “Kuroko type” deposits
- Deposited at or near the sea floor in moderate to deep water

Liontown and Handcuff deposits

- Occurs within dacite to andesite of the Trooper Creek Formation (higher in the stratigraphy than Thalanga)
- Commodities include lead, zinc, copper, silver and minor gold
- Tabular bodies
- Typical of VHMS deposits from back-arc “Kuroko type” deposits

Waterloo and Magpie deposits

- Occur within dacite to andesite of the Trooper Creek Formation (higher in the stratigraphy than Thalanga)
- Commodities include lead, zinc, copper, silver and minor gold
- Lens-shaped tabular bodies
- Interpreted to have formed at or near the sea floor in moderate to deep water
- Deposition of the sulphides accompanied by explosive dacitic cryptodome
- Cordierite – andalusite metamorphism caused by nearby intrusive

Highway-Reward

- Occur within rhyolite, dacite of the Trooper Creek Formation (higher in the stratigraphy than Thalanga)
- Commodities are mainly copper, and gold
- Pipe like bodies
- Different in shape of orebody and commodities to other deposits in the belt

Balcooma, Dry River and Surveyor 1

- Occur within metapelites and metarhyolite, of the Balcooma Metavolcanics
- Two lenses are lead/zinc rich and one is copper rich
- Lens like bodies
- Recent age dating suggests the bodies formed in the Early Ordovician (~480Ma)
- Textures suggest the deposit is a deformed and metamorphosed volcanogenic massive sulphide similar to those in the Seventy Mile range Group.

Conclusions

- The Cambrian-Ordovician volcano-sedimentary rocks in north Queensland are part of the Thomson Fold Belt, which underlies a large part of Queensland.
- Much of the Thomson Fold Belt sequence appears to be deposited in a large fan, outboard of Gondwana.
- The Cambrian-Ordovician volcano-sedimentary rocks in north Queensland are almost certainly deposited in an extensional back-arc setting
- Mineralisation is Volcanic Hosted Massive Sulphide type typical of deposits in a back-arc setting “Kuroko type”
- Because the Thalanga Province includes Cambrian-Ordovician rocks at different crustal levels, it may provide us with an opportunity to study the mineralising system at different crustal levels.