



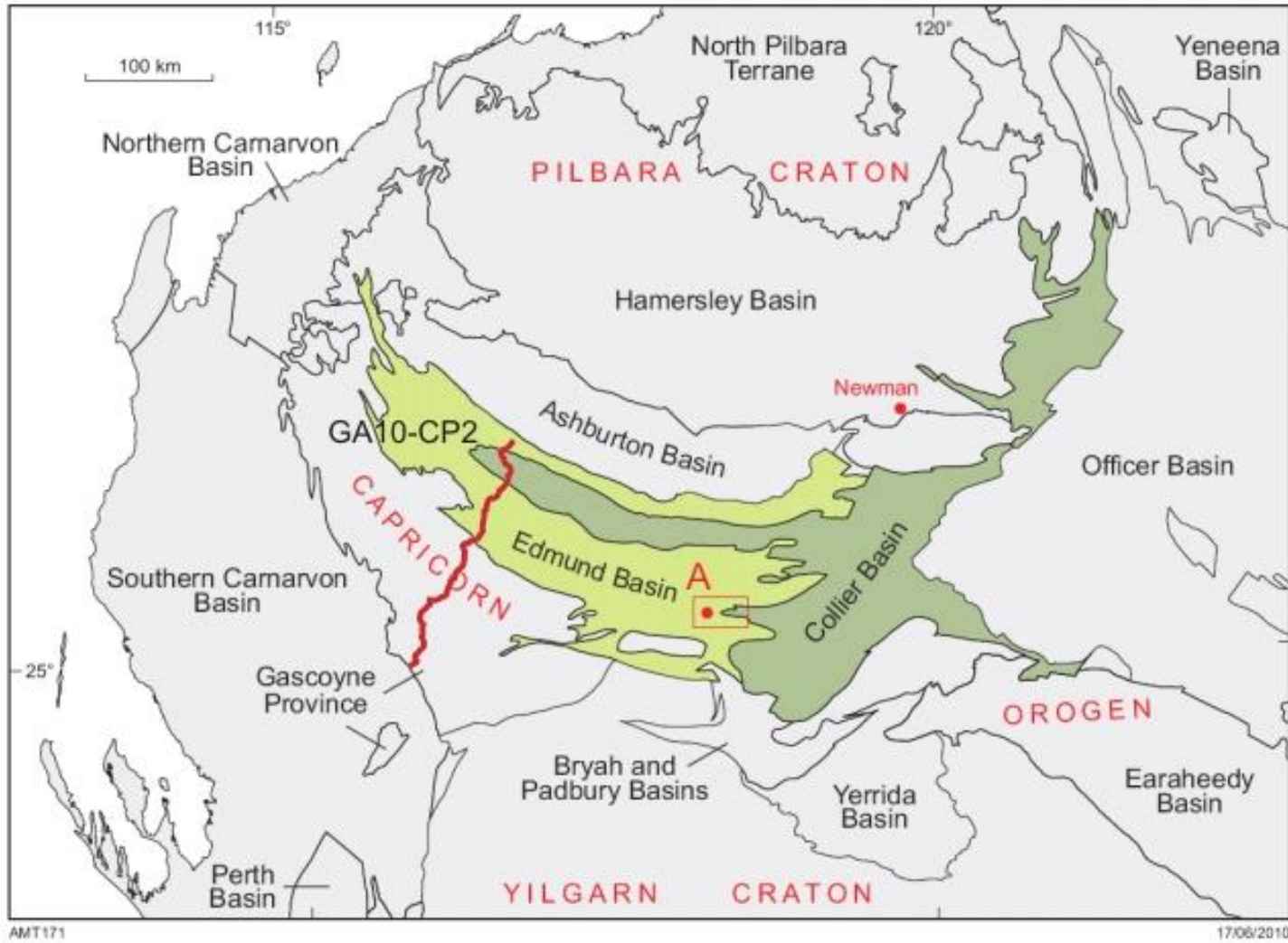
Government of Western Australia
Department of Mines and Petroleum

Geology of the Edmund and Collier Groups

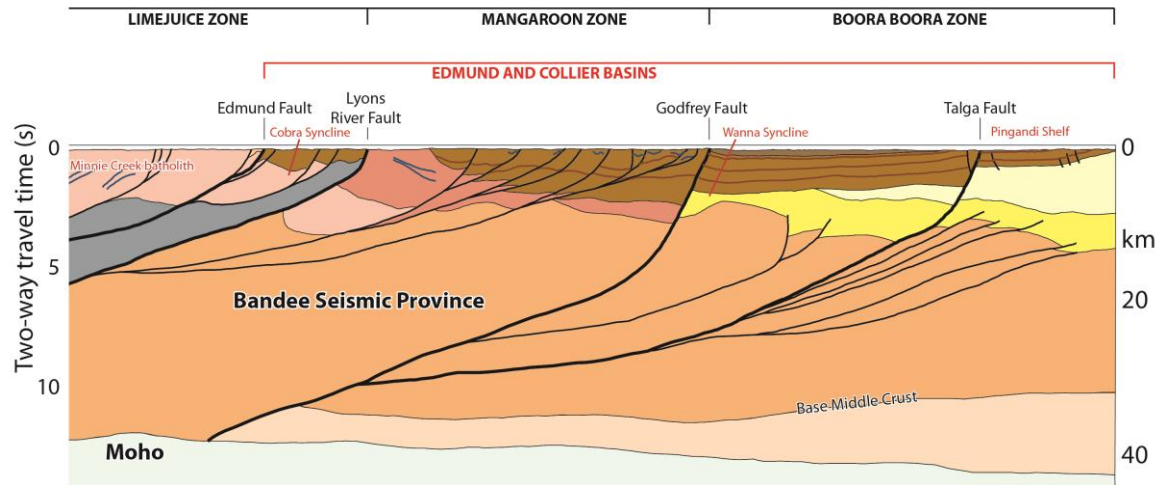
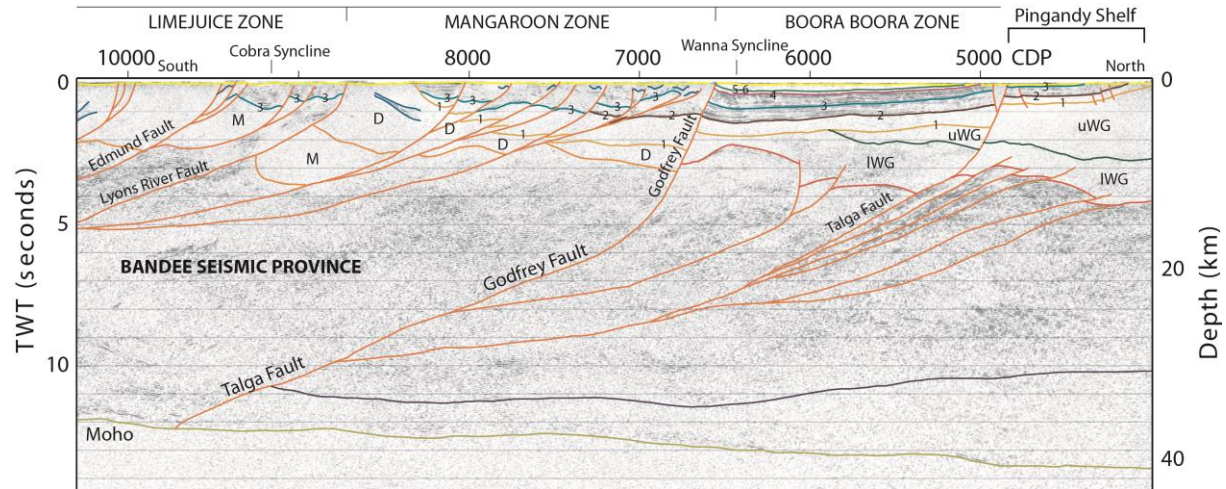
HN Cutten, AM Thorne, SP Johnson



Edmund and Collier Basins



GA10-CP2



Stratigraphy of the Edmund & Collier Basins



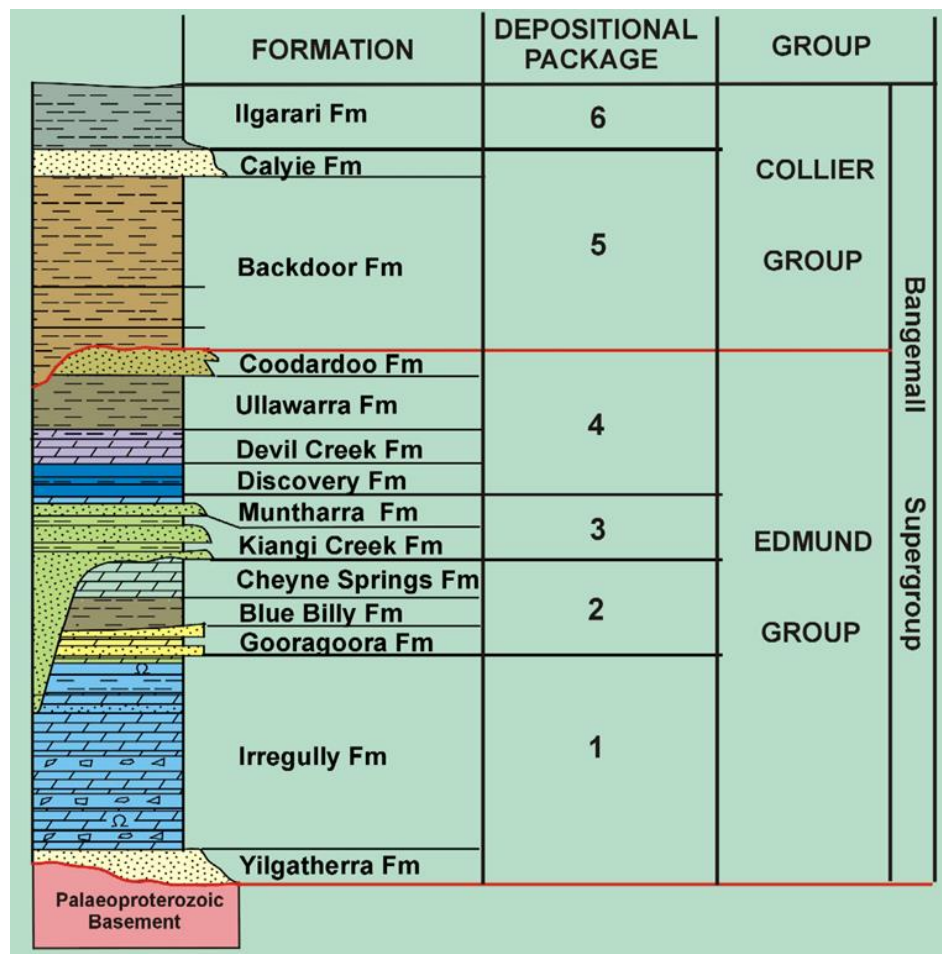
Kulkatharra Dolerite c. 1070 Ma



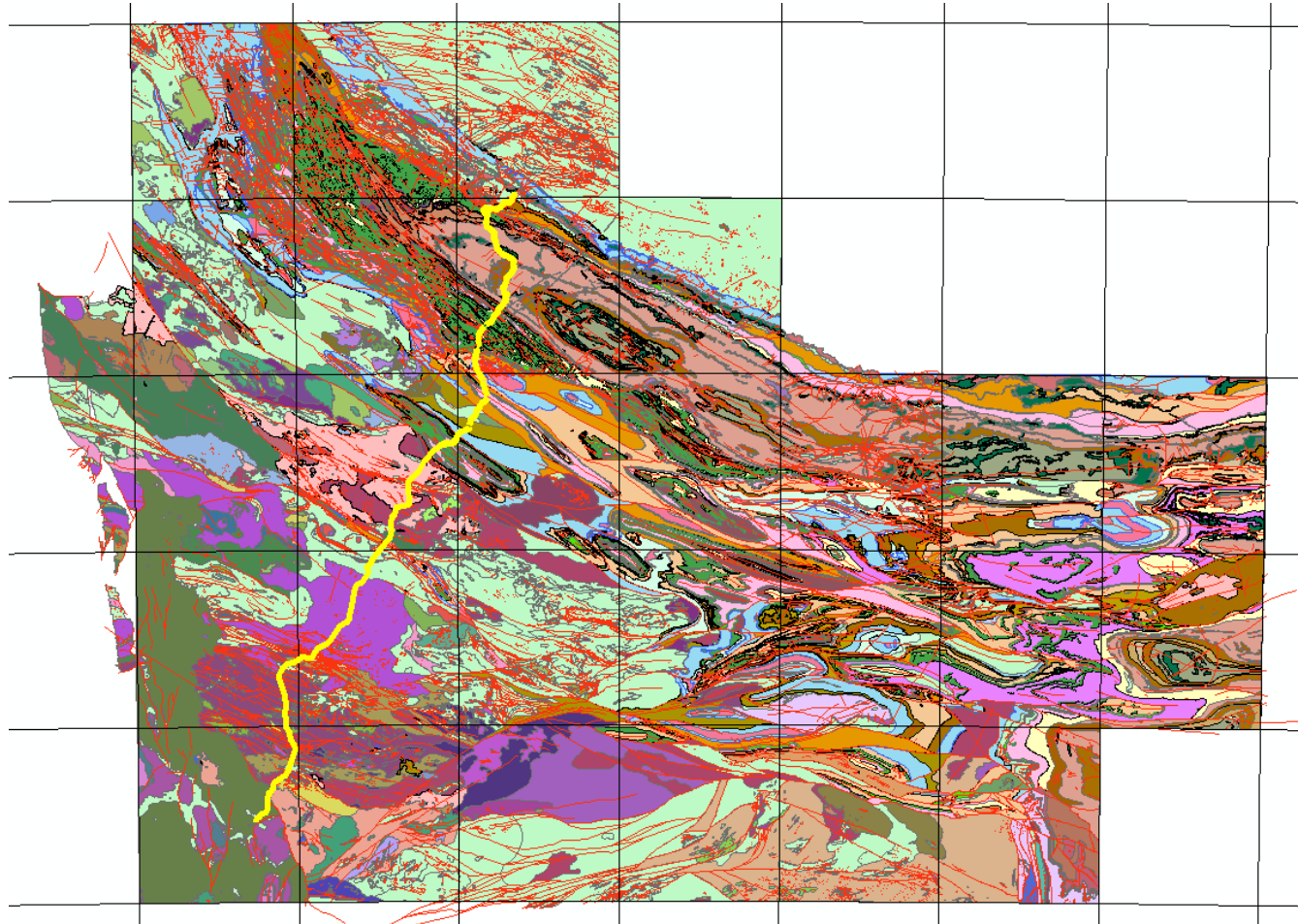
Narimbunna Dolerite c. 1465 Ma
Volcaniclastics c. 1465 Ma



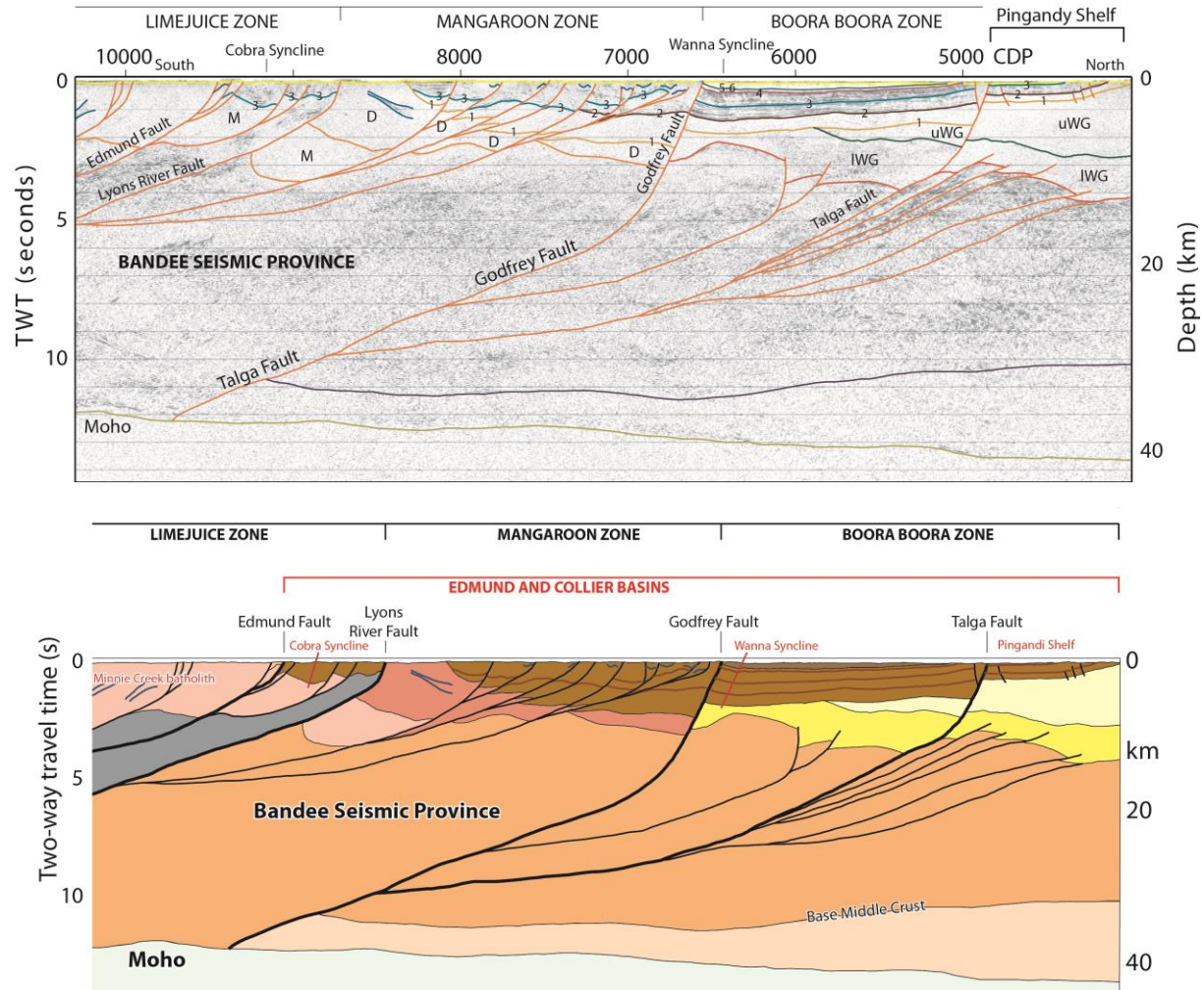
Durlacher Supersuite 1620 Ma



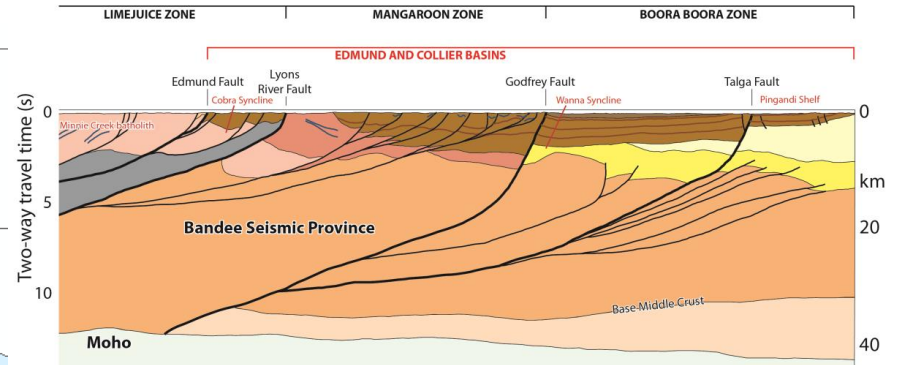
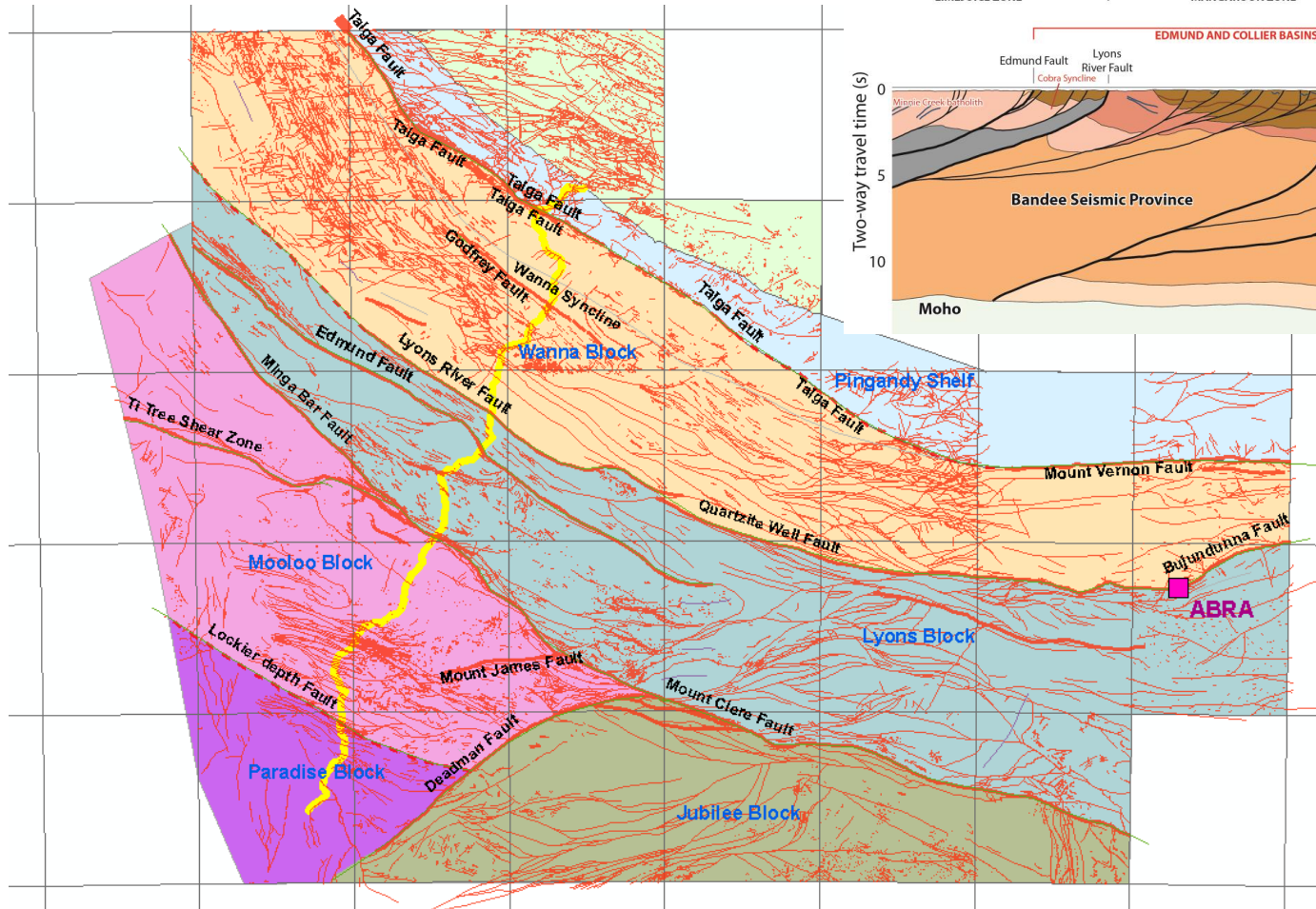
Folding and faulting



GA10-CP2



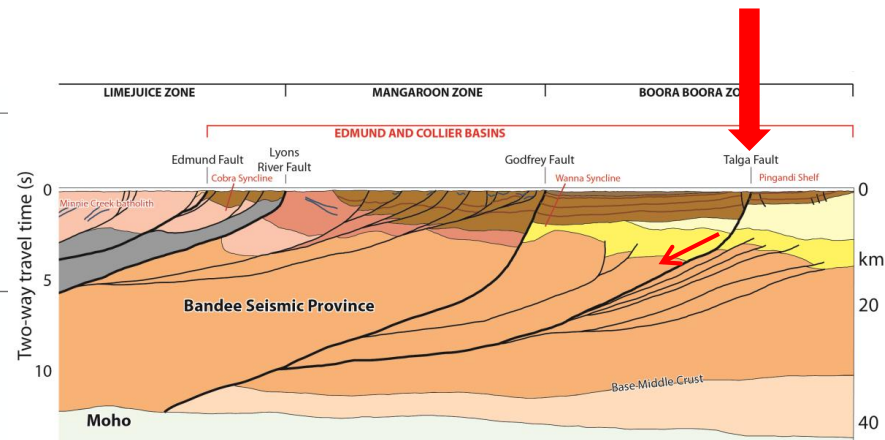
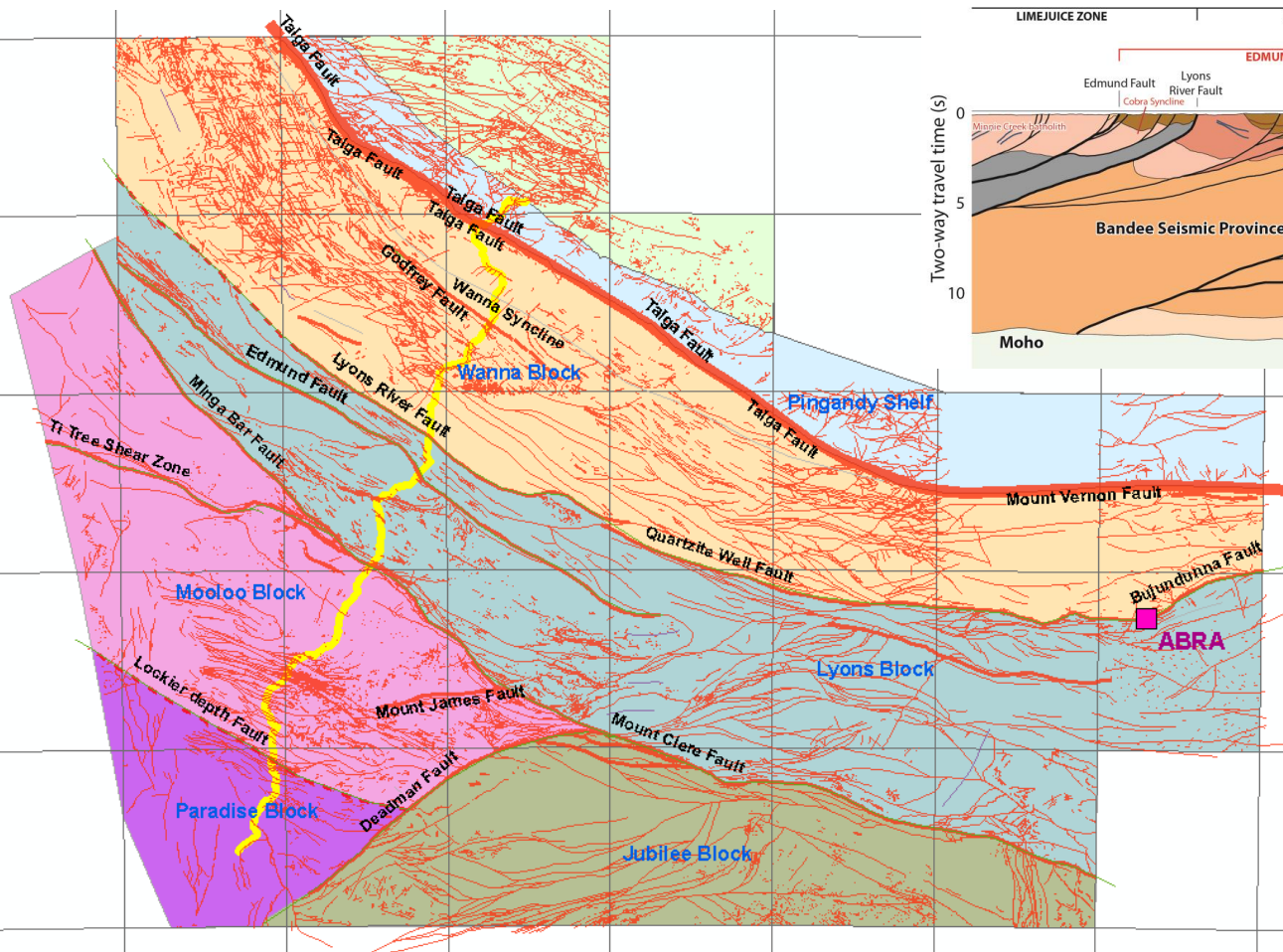
Fault blocks



Major Faults



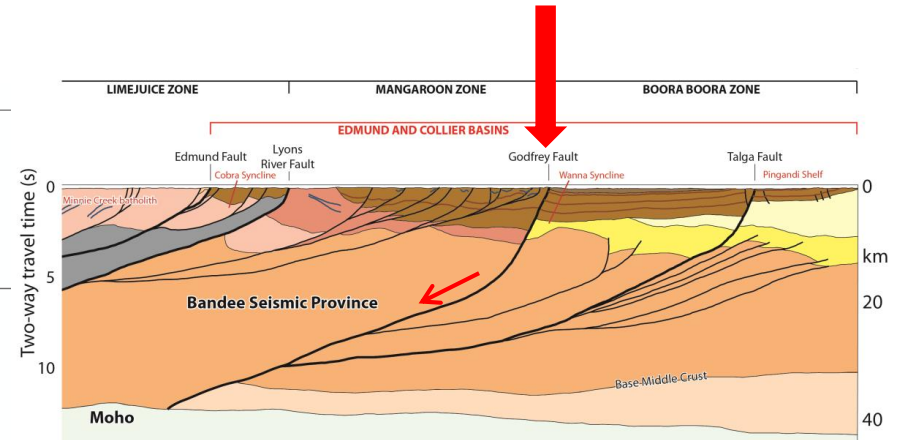
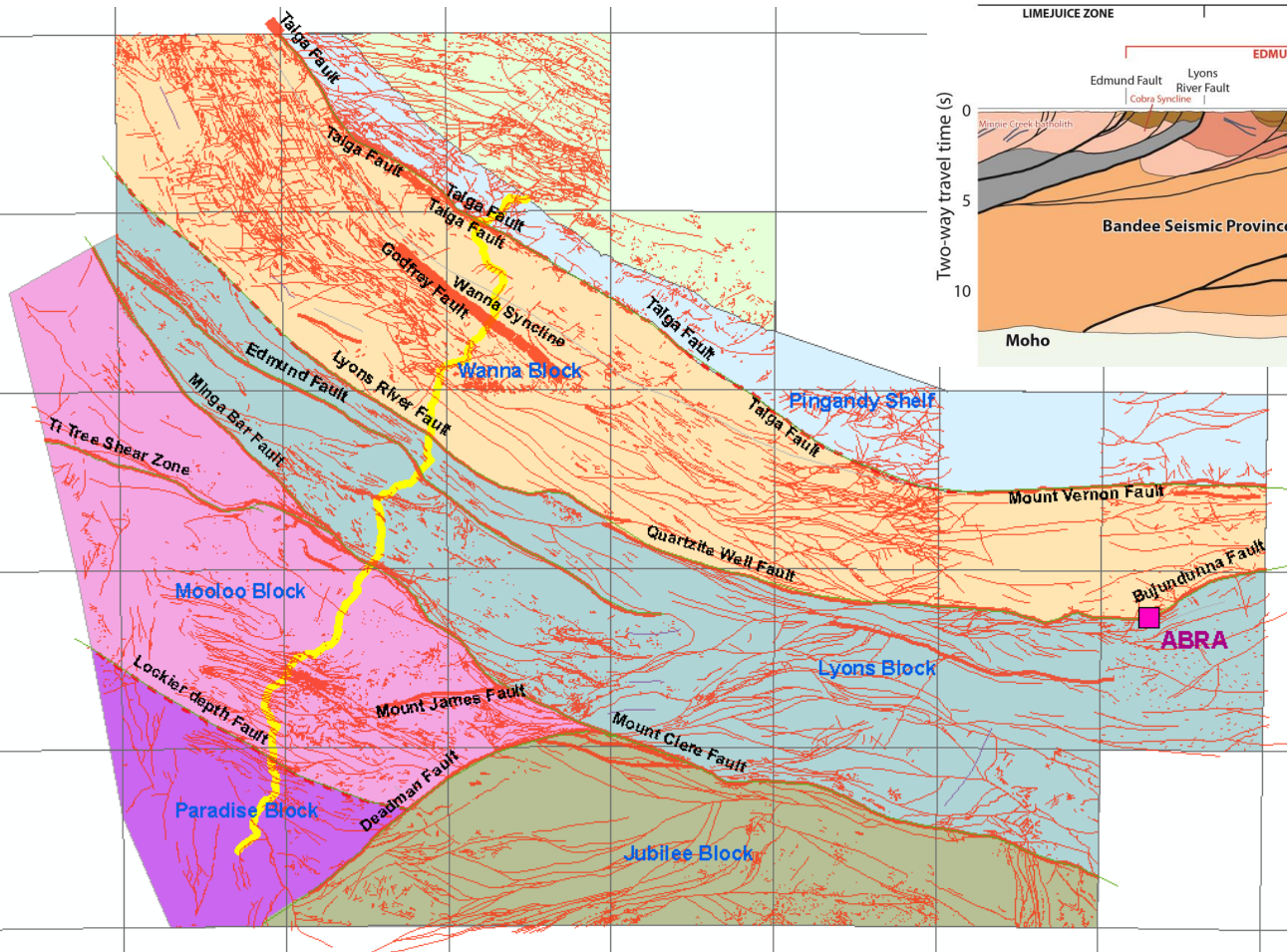
Talga Fault - Mount Vernon Fault



Major Faults



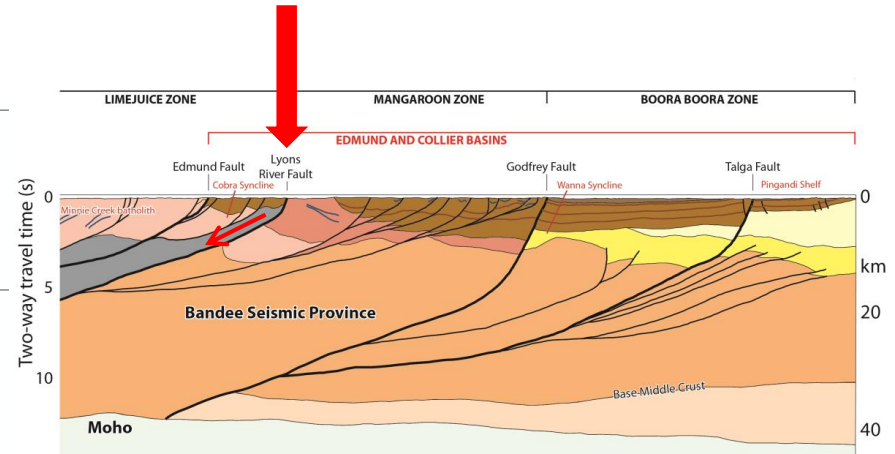
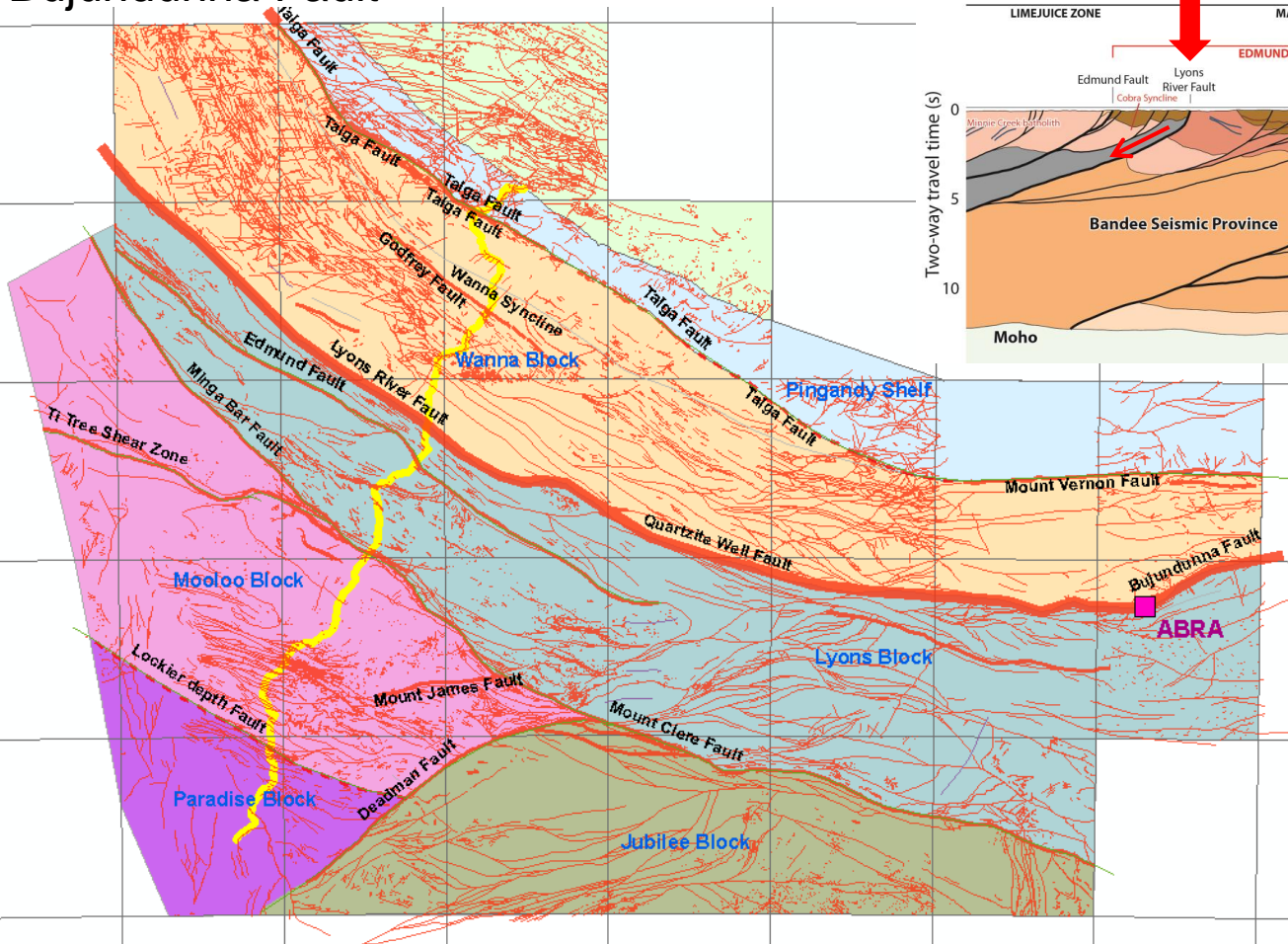
Godfrey Fault



Major faults



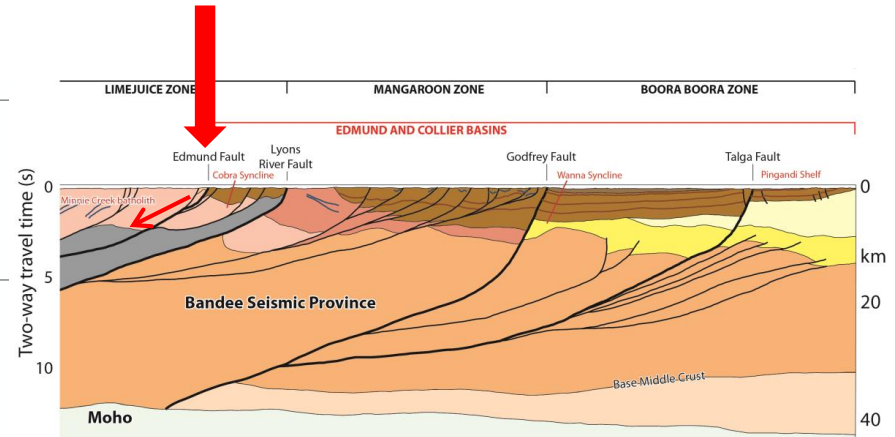
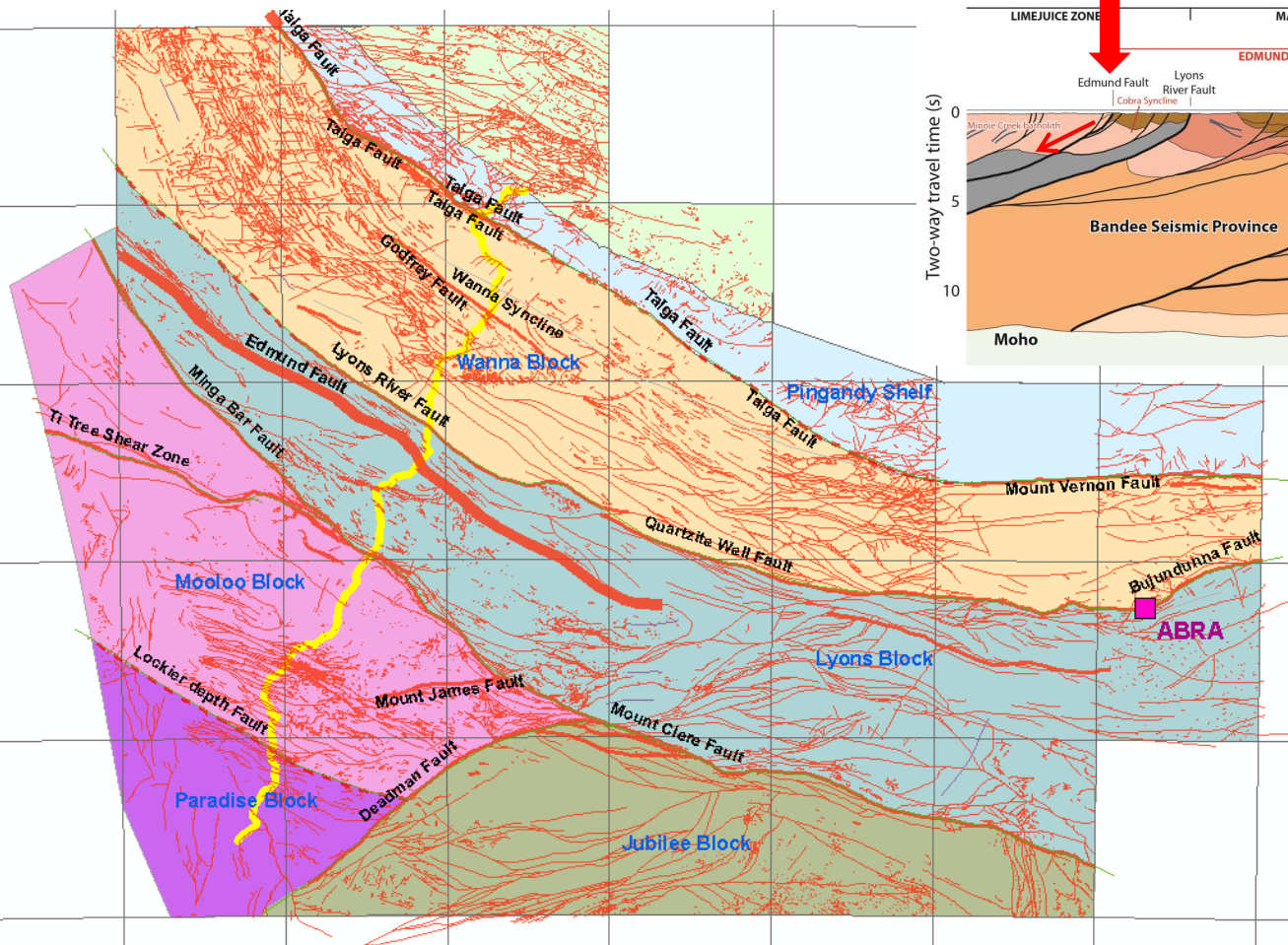
Lyons River Fault - Quartzite Well Fault - Bujundunna Fault



Major Faults



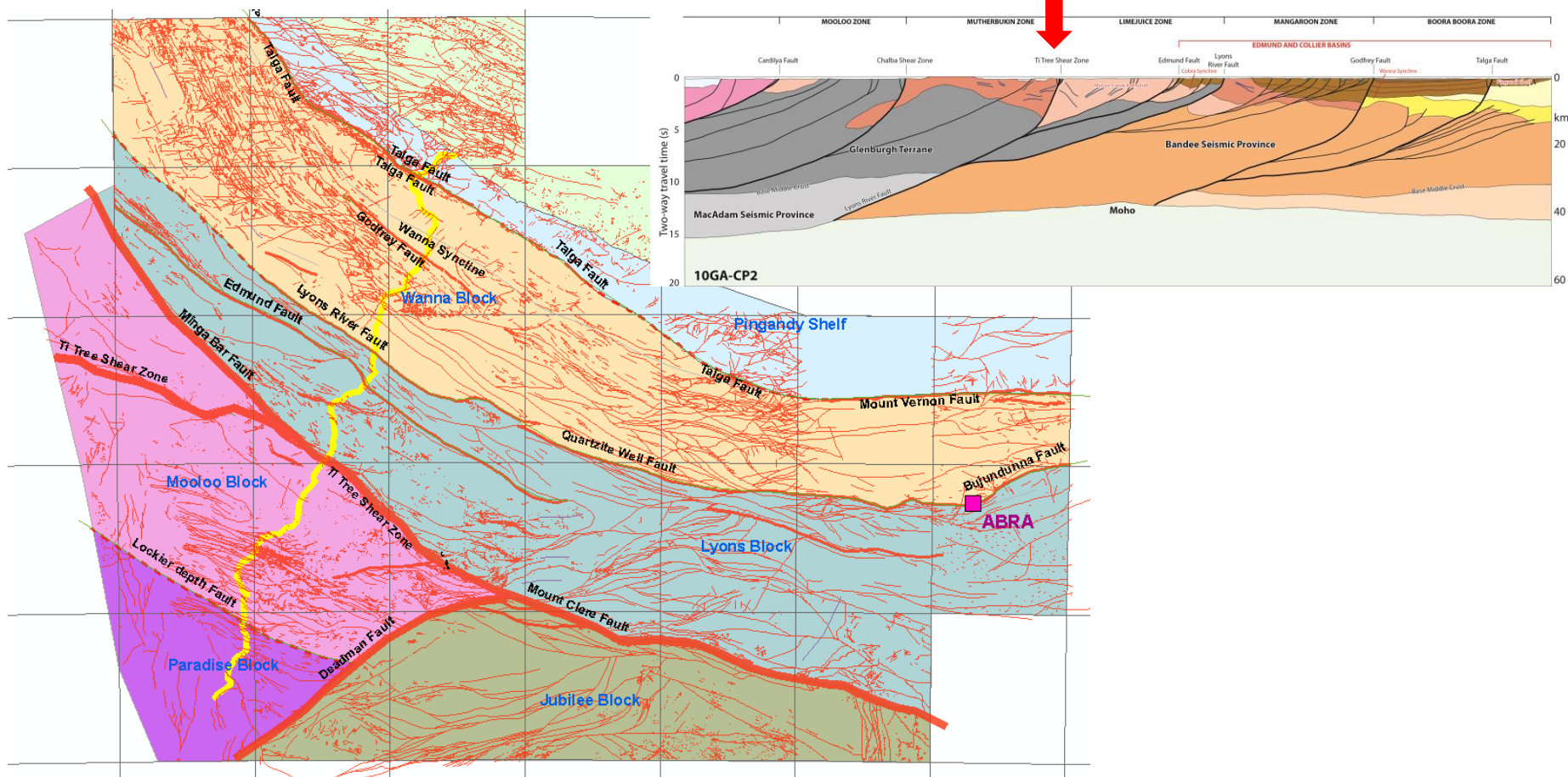
Edmund Fault



Major faults



Ti Tree Shear Zone – Mount Clere Fault Minga Bar Fault & Deadman Fault



Package 1:



FORMATION	DEPOSITIONAL PACKAGE	GROUP	
Ilgarari Fm	6	COLLIER GROUP	
Calyte Fm			
Backdoor Fm	5	EDMUND GROUP	
Coodardoo Fm			
Ullawarra Fm	4	Supergroup	
Devil Creek Fm			
Discovery Fm			
Muntharra Fm	3		
Kiangi Creek Fm			
Cheyne Springs Fm	2		
Blue Billy Fm			
Gooragoora Fm			
Irregully Fm	1		
Yilgatherra Fm			
Palaeoproterozoic Basement			

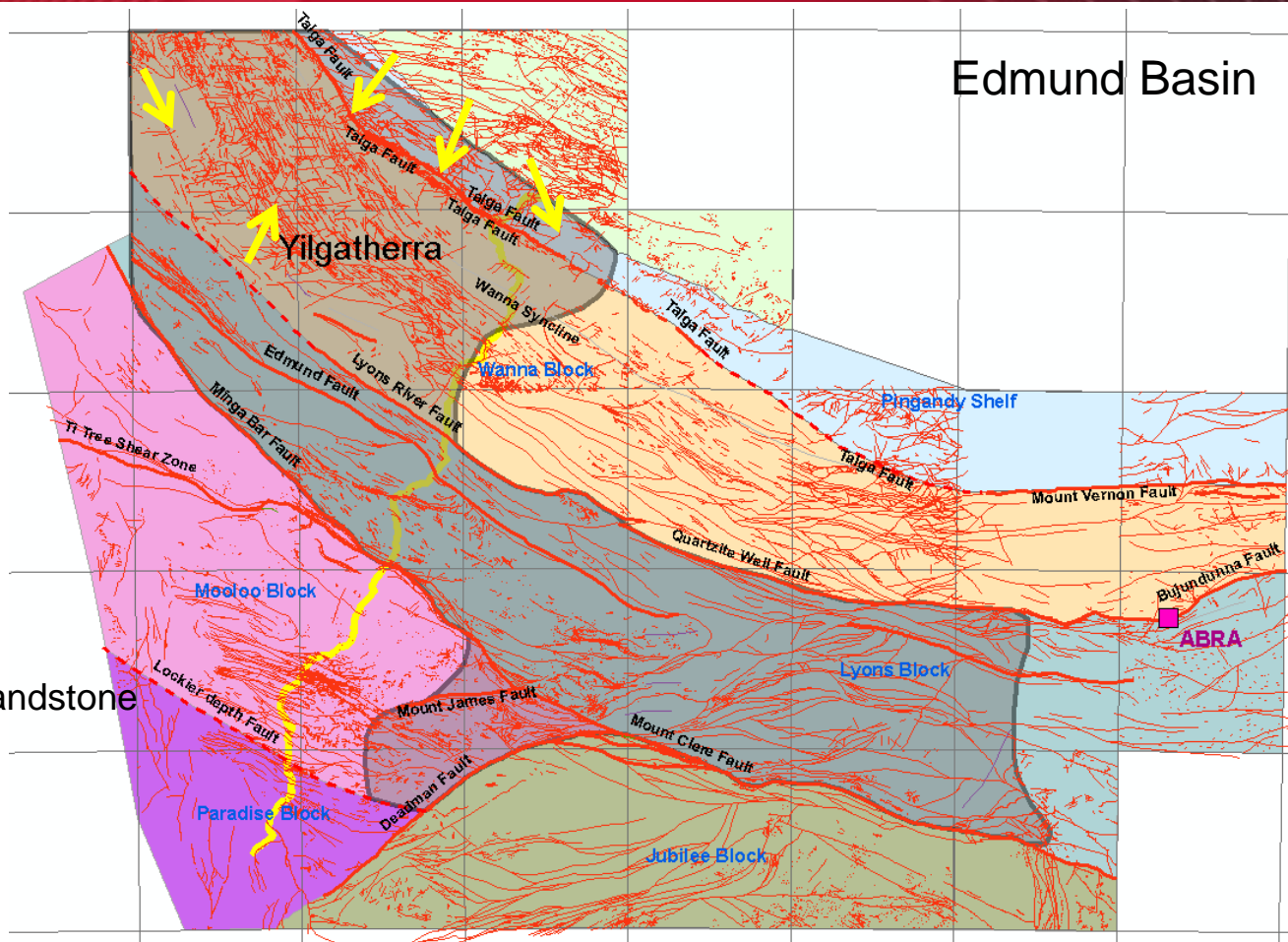
Yilgatherra Formation

Pingandy Self

30 m fluvial to shallow marine sandstone
fluvial to peritidal environment

Basin

350 m basal conglomerate
quartz sandstone & siltstone
fluvial to shallow-marine environment



Package 1:



FORMATION	DEPOSITIONAL PACKAGE	GROUP	Supergroup
Ilgari Fm	6	COLLIER GROUP	
Calyte Fm			
Backdoor Fm	5	EDMUND GROUP	
Coodardoo Fm			
Ullawarra Fm	4	EDMUND GROUP	
Devil Creek Fm			
Discovery Fm			
Muntharra Fm			
Kiangi Creek Fm	3	EDMUND GROUP	
Chayne Springs Fm	2		
Blue Billy Fm			
Gooraooora Fm			
Irregully Fm			
Yilgatherra Fm			
Palaeoproterozoic Basement			

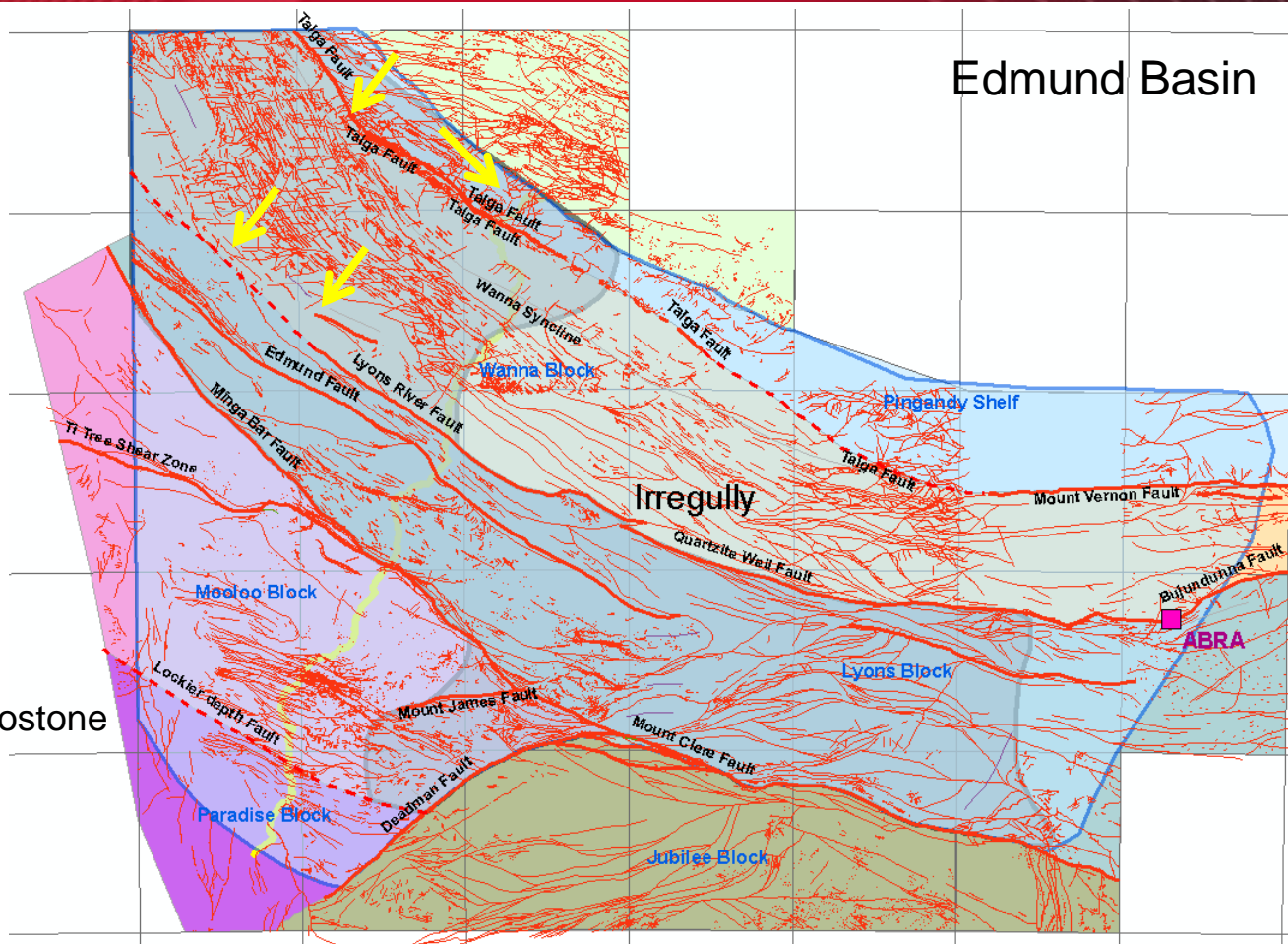
Irregully Formation

Pingandy Self

350 m basal conglomerate and sandstone and stromatolitic dolostone
Peritidal carbonate platform

Basin

3 km slope breccias, dolomitic sandstone & siltstone
Fulvial to subtidal environment

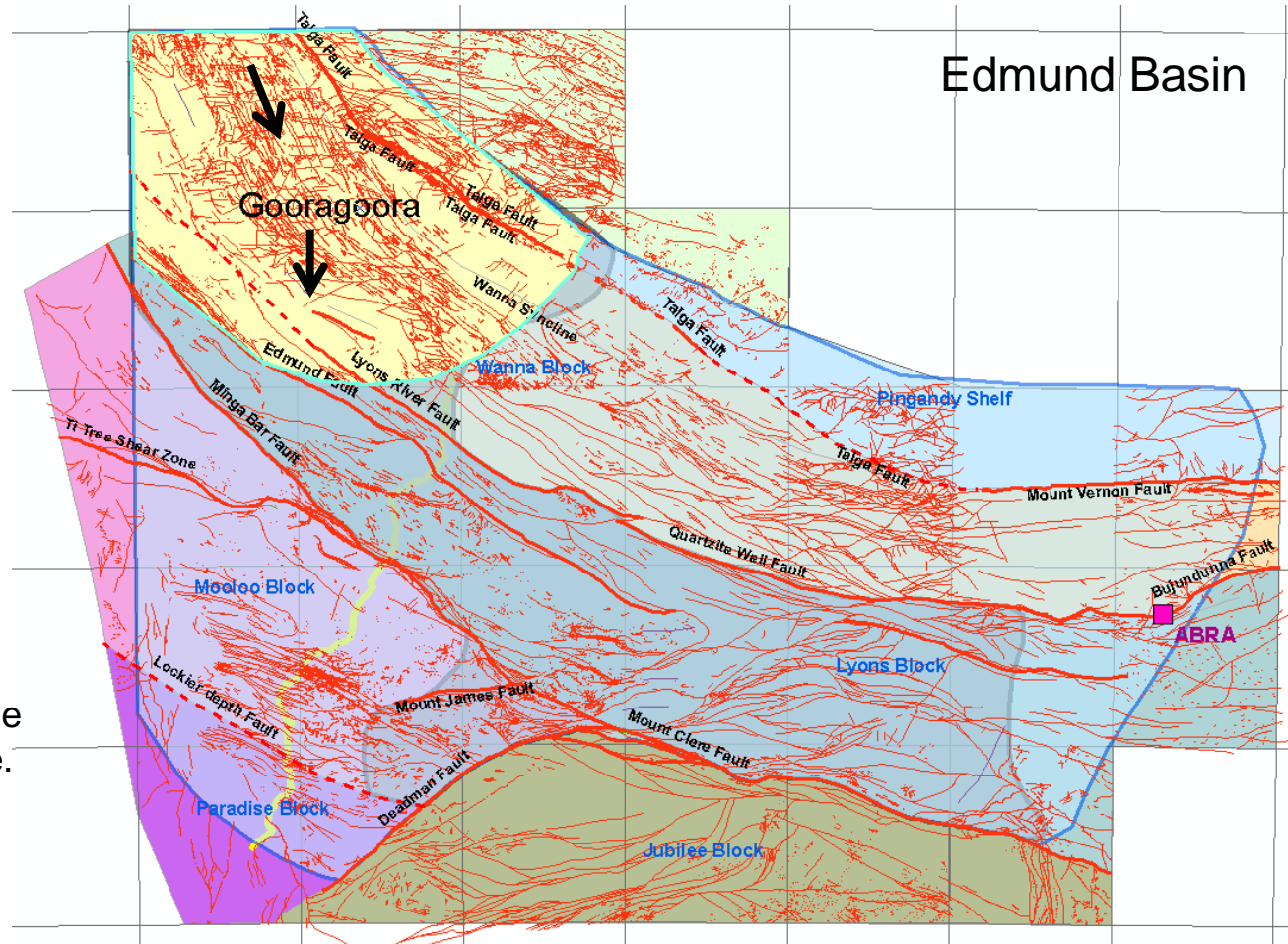


Package 2



FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgarari Fm	6	COLLIER
Calyie Fm		
Backdoor Fm	5	GROUP
Coodardoo Fm		
Ullawarra Fm	4	EDMUND
Devil Creek Fm		
Discovery Fm		
Muntharra Fm	3	EDMUND
Kiangi Creek Fm		
Cheyne Springs Fm	2	GROUP
Blue Bluff Fm		
Gooragoora Fm		
Irregularly Fm	1	
Yilgatherra Fm		

Palaeoproterozoic Basement



Gooragoora Formation

Prograding delta

Fine to coarse -grained sandstone and some interbedded carbonate.
 10m on Pingandy Shelf
 150m south of Talga Fault

Package 2:



FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgarari Fm	6	COLLIER
Calyie Fm		
Backdoor Fm	5	GROUP
Coodardoo Fm		
Ullawarra Fm	4	EDMUND
Devil Creek Fm		
Discovery Fm		
Muntharra Fm	3	GROUP
Kiangi Creek Fm		
Cheyne Springs Fm		
Blue Billy Fm	1	EDMUND
Gooraooora Fm		
Irreguly Fm	1	EDMUND
Yilgatherra Fm		

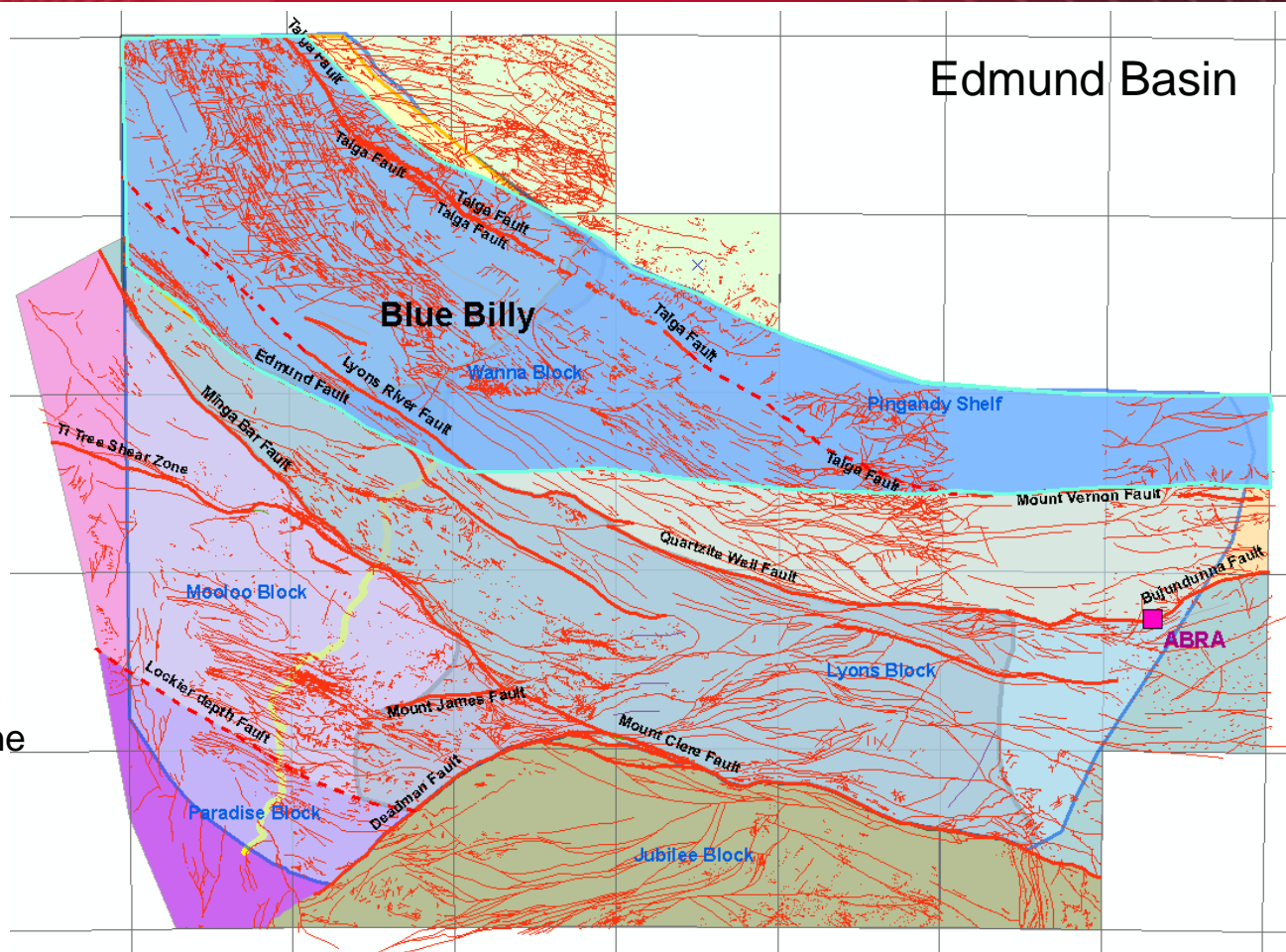
Palaeoproterozoic Basement

Blue Billy Formation

Rise in sea level

30-500 m of pyritic carbonaceous siltstone and turbidite sandstone

Deep-water anoxic shelf environment

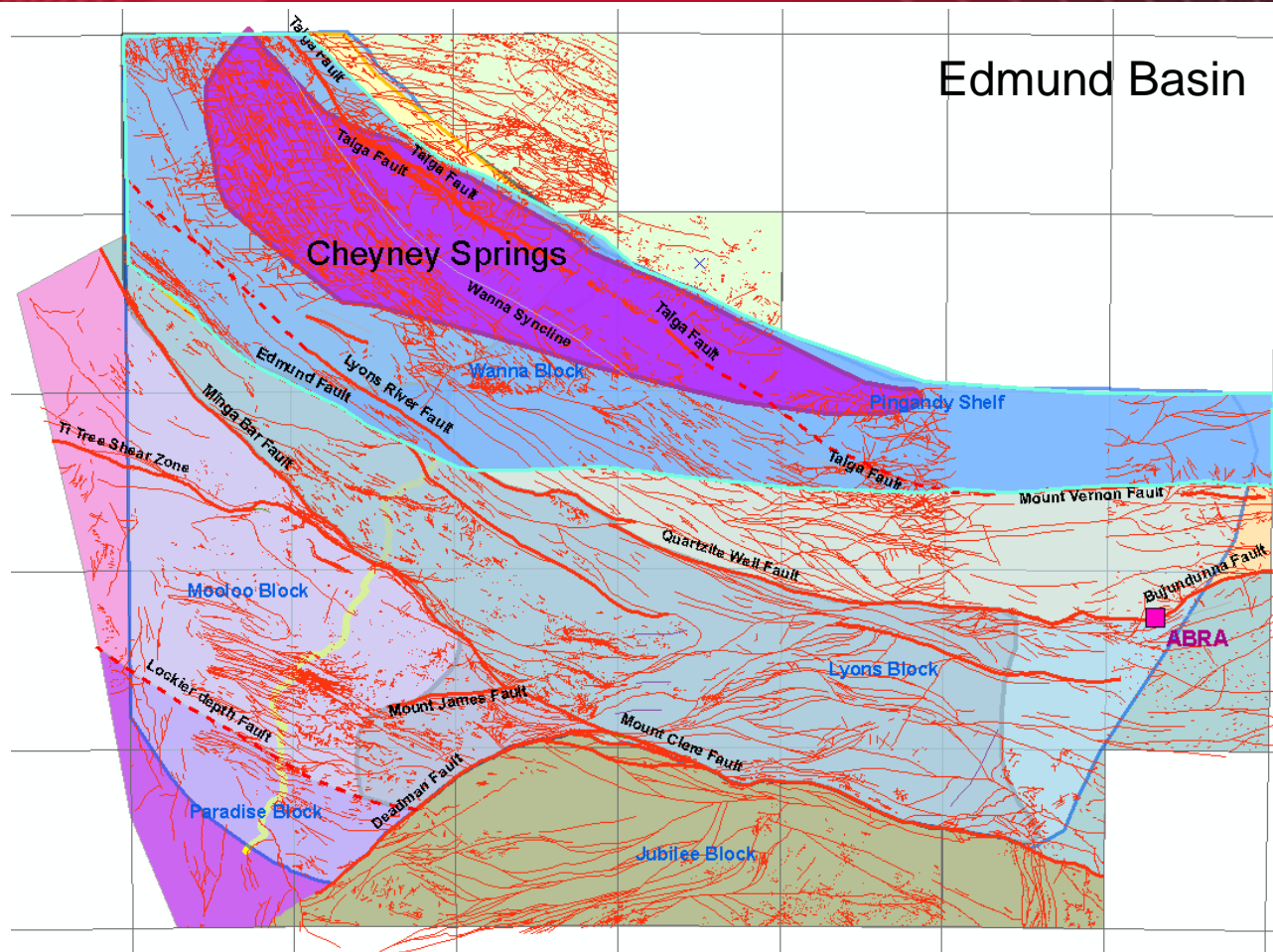


Package 2



FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgarari Fm	6	COLLIER
Calyie Fm		
Backdoor Fm	5	GROUP
Coodardoo Fm		
Ullawarra Fm	4	EDMUND
Devil Creek Fm		
Discovery Fm		
Muntharra Fm		
Kiangi Creek Fm	3	GROUP
Cheyne Springs Fm		
Blue Bluff Fm	2	EDMUND
Gooraooora Fm		
Irregully Fm	1	
Yilgatherra Fm		

Palaeoproterozoic Basement



Cheyne Springs Formation

Basin infill

50-300 m of dolomitic siltstone and quartz sandstone

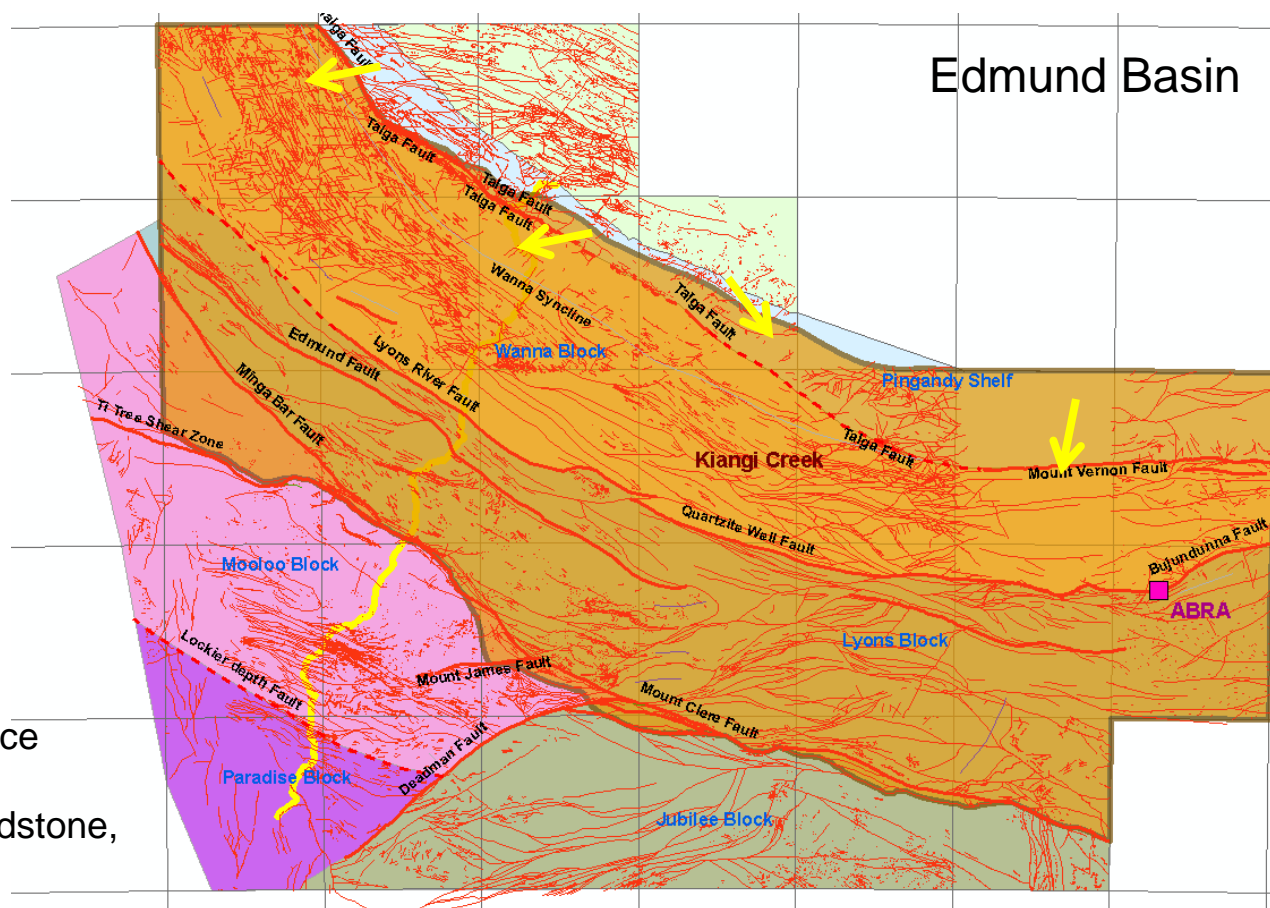
Distal sub-tidal carbonate shelf environment

Package 3



FORMATION	DEPOSITIONAL PACKAGE	GROUP	Barramundi Supergroup
Ilgarari Fm	6	COLLIER	
Calyie Fm			
Backdoor Fm	5	GROUP	
Coodardoo Fm			
Ullawarra Fm	4	EDMUND	
Devil Creek Fm			
Discovery Fm			
Muntharra Fm			
Kiangi Creek Fm	2	GROUP	
Cheyne Springs Fm			
Blue Bluff Fm			
Gooraooora Fm	1	GROUP	
Irregully Fm			
Yilgatherra Fm			

Palaeoproterozoic Basement



Kiangi Creek Formation

- 50 m to 2.6 km

Eastern region

- Upper: fan delta environment sandstone and siltstone
- Erosional marine flooding surface
- Lower: alluvial fan environment conglomerate and coarse sandstone,

Western region

- Deep shelf environment
- siltstone, turbiditic sandstone, mass flow quartz sandstone, carbonaceous siltstone

Package 3



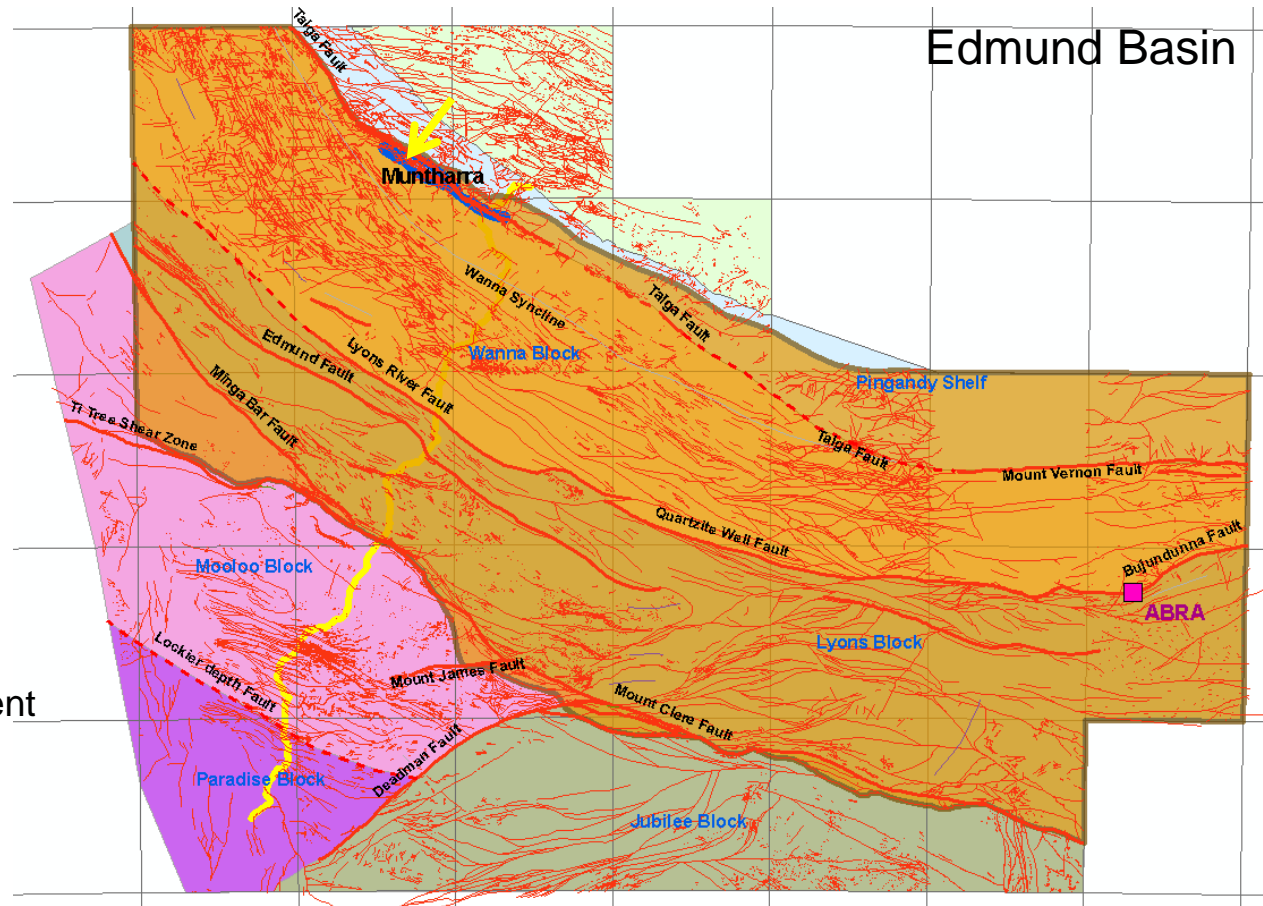
FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgarari Fm	6	COLLIER GROUP
Calyie Fm		
Backdoor Fm	5	EDMUND GROUP
Coodardoo Fm		
Ullawarra Fm	4	EDMUND GROUP
Devil Creek Fm		
Discovery Fm		
Muntharra Fm		
Kiangi Creek Fm		EDMUND GROUP
Cheyne Springs Fm	2	
Blue Bluff Fm		
Gooraooora Fm		EDMUND GROUP
Irreguly Fm	1	
Yilgatherra Fm		

Palaeoproterozoic Basement

Muntharra Formation

Pingandy Shelf

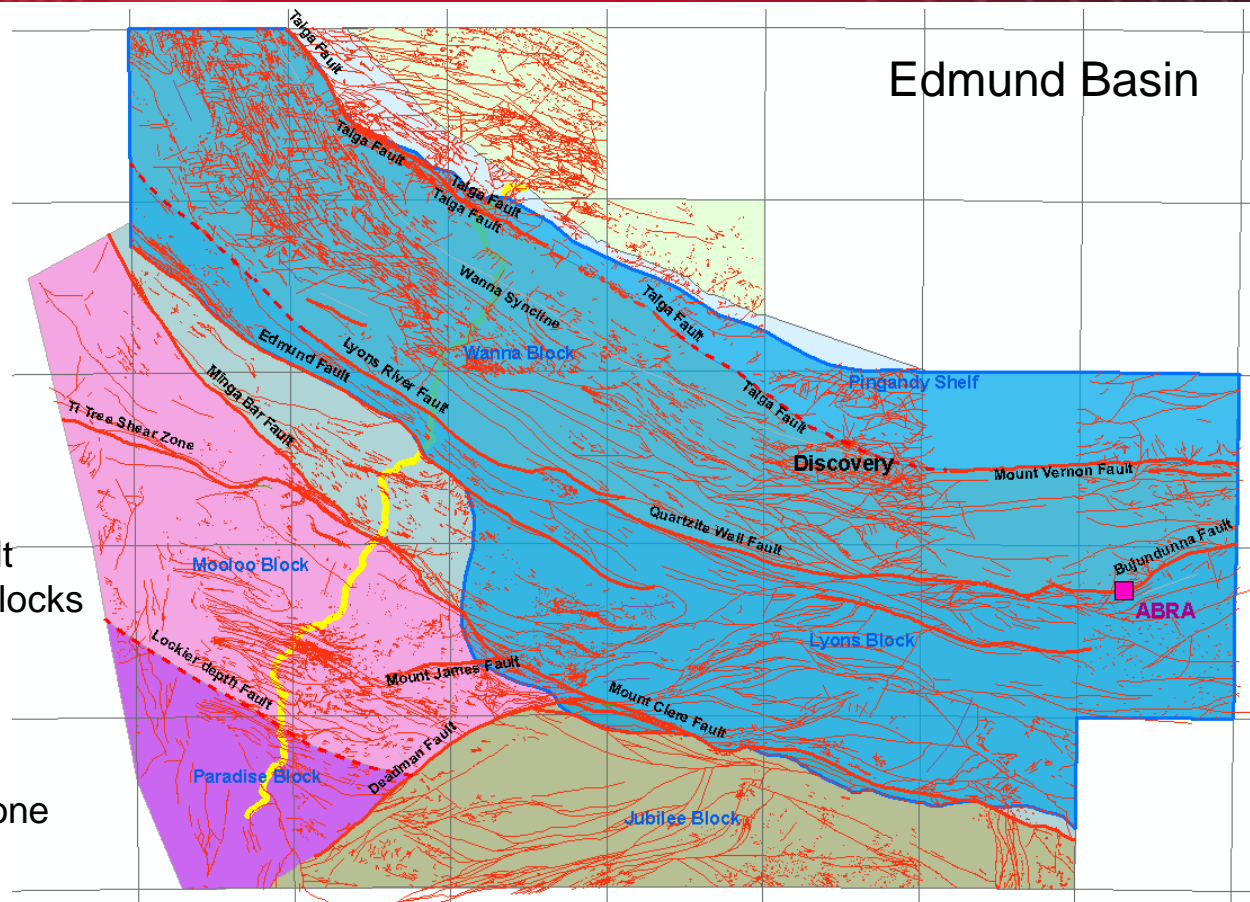
- 30-50 m of dolostone
- Shelf edge carbonate environment



Package 4



FORMATION	DEPOSITIONAL PACKAGE	GROUP		
Ilgarari Fm	6	COLLIER	Barramulla	
Calyie Fm				
Backdoor Fm	5	GROUP		
Coodardoo Fm				
Ullawarra Fm	4	EDMUND		Supergroup
Devil Creek Fm				
Discovery Fm				
Muntharra Fm				
Kiangal Creek Fm	3	GROUP		
Cheyne Springs Fm				
Blue Bliny Fm	2	GROUP		
Gooraooora Fm				
Irregularly Fm	1			
Yilgatherra Fm				



Package 4

- Ongoing movement on Talga Fault
- Downtrop of Wanna and Lyons Blocks

Discovery Formation

Regional marker unit

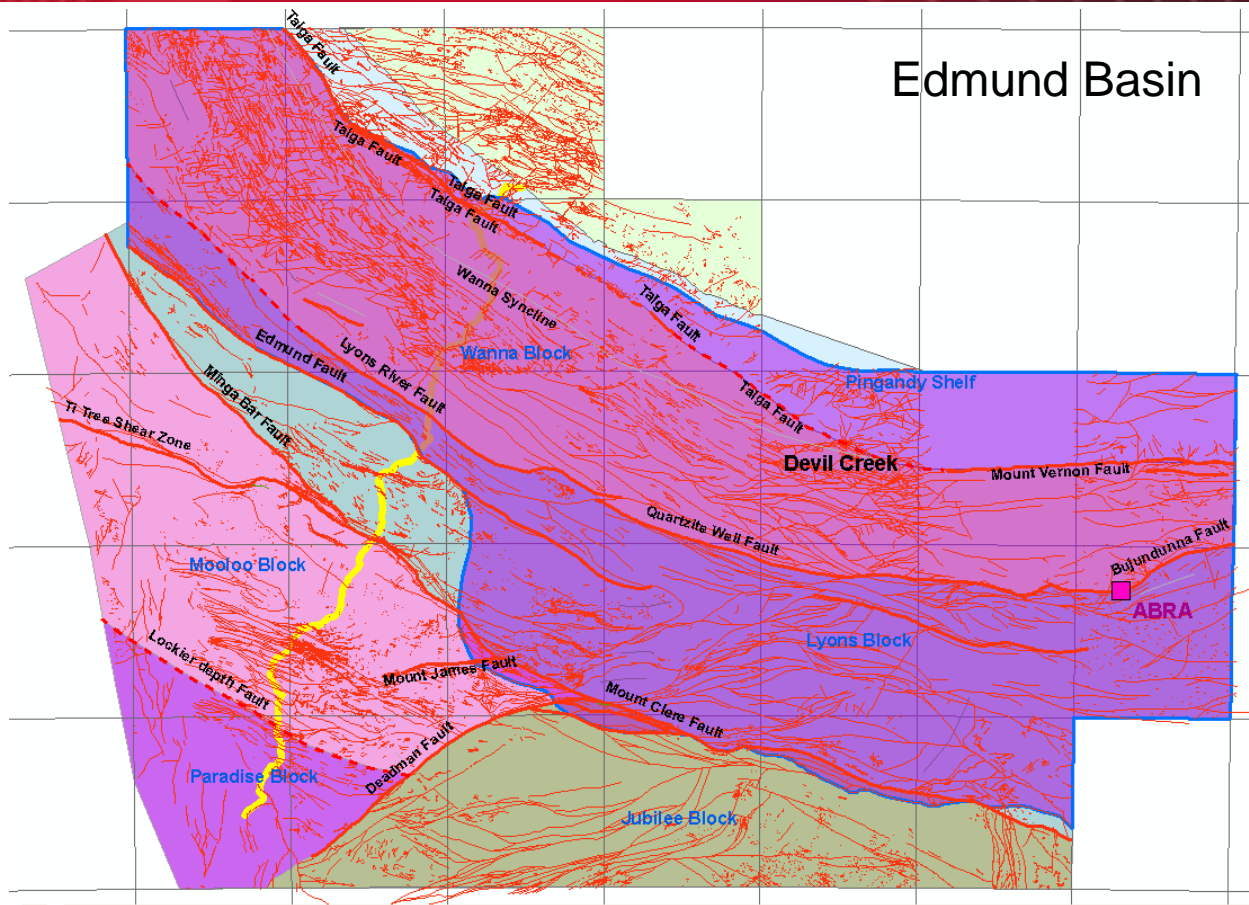
- 50-365 m of silicified, pyritic siltstone and black chert
- anoxic environment below storm wave base
- deposited following a marine transgression

Package 4



FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgarari Fm	6	COLLIER
Calyie Fm		
Backdoor Fm	5	GROUP
Coodardoo Fm		
Ullawarra Fm	3	EDMUND
Devil Creek Fm		
Discovery Fm		
Muntharra Fm		
Kiangal Creek Fm	2	GROUP
Cheyne Springs Fm		
Blue Shilly Fm		
Gooraooora Fm	1	GROUP
Irreguly Fm		
Yilgatherra Fm		

Palaeoproterozoic Basement



Devil Creek Formation

- 80-450 m dolograine and dolomudstone
- Sub-tidal slope to basinal environment

Package 4

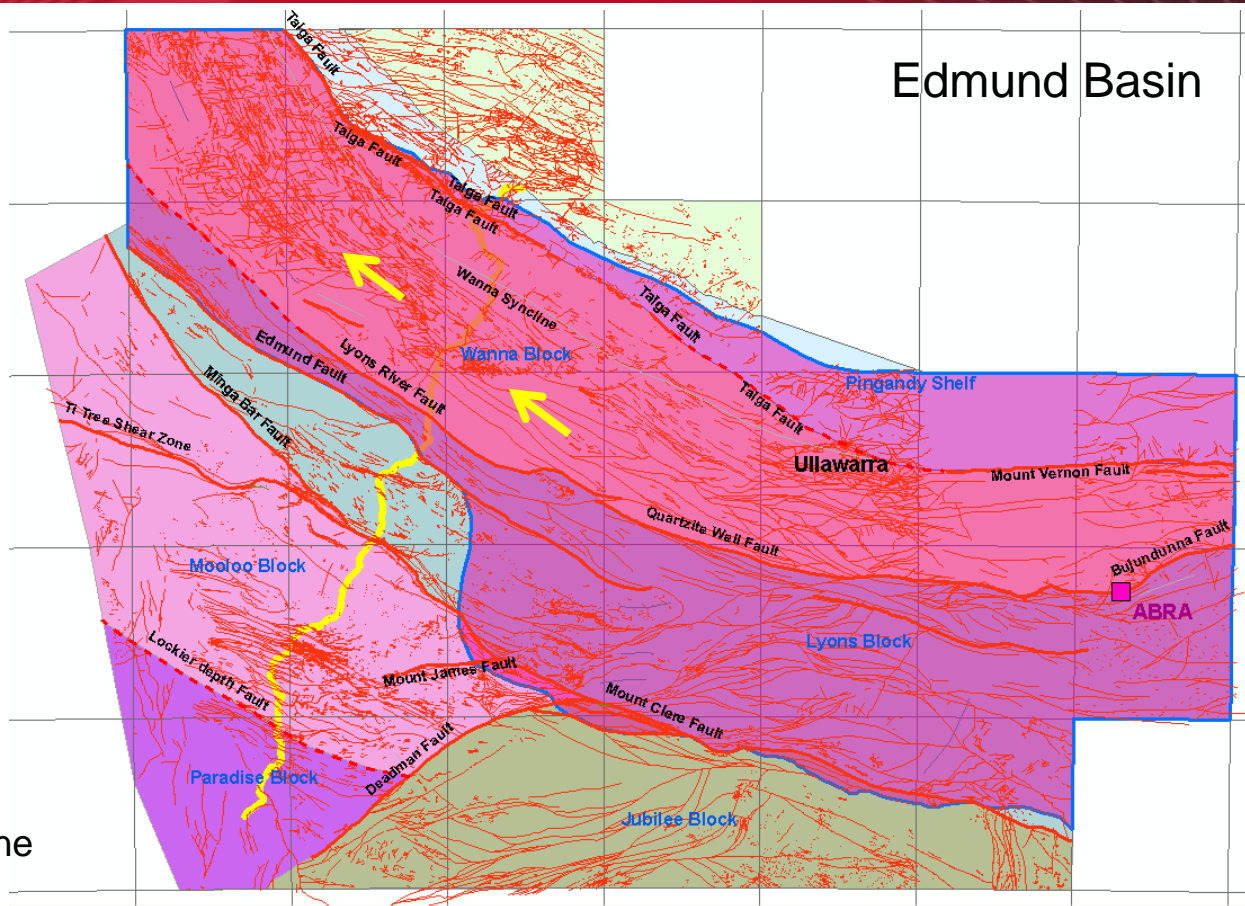


FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgarari Fm	6	COLLIER GROUP
Calyie Fm		
Backdoor Fm	5	EDMUND GROUP
Coodardoo Fm		
Ullawarra Fm	4	EDMUND GROUP
Devil Creek Fm		
Discovery Fm	3	EDMUND GROUP
Muntharra Fm		
Kiangi Creek Fm	2	EDMUND GROUP
Cheyne Springs Fm		
Blue Billy Fm	1	EDMUND GROUP
Georasora Fm		
Irregularly Fm		
Yilgatherra Fm		

← Ullawarra Fm (Package 4)

Ullawarra Formation

- 100 - 600 m of laminated siltstone mudstone and sandstone
- Sub-tidal slope to basinal environment
- Volcaniclastics dated c. 1465 Ma
- Curran Member, turbiditic sandstone and parallel-planar siltstone

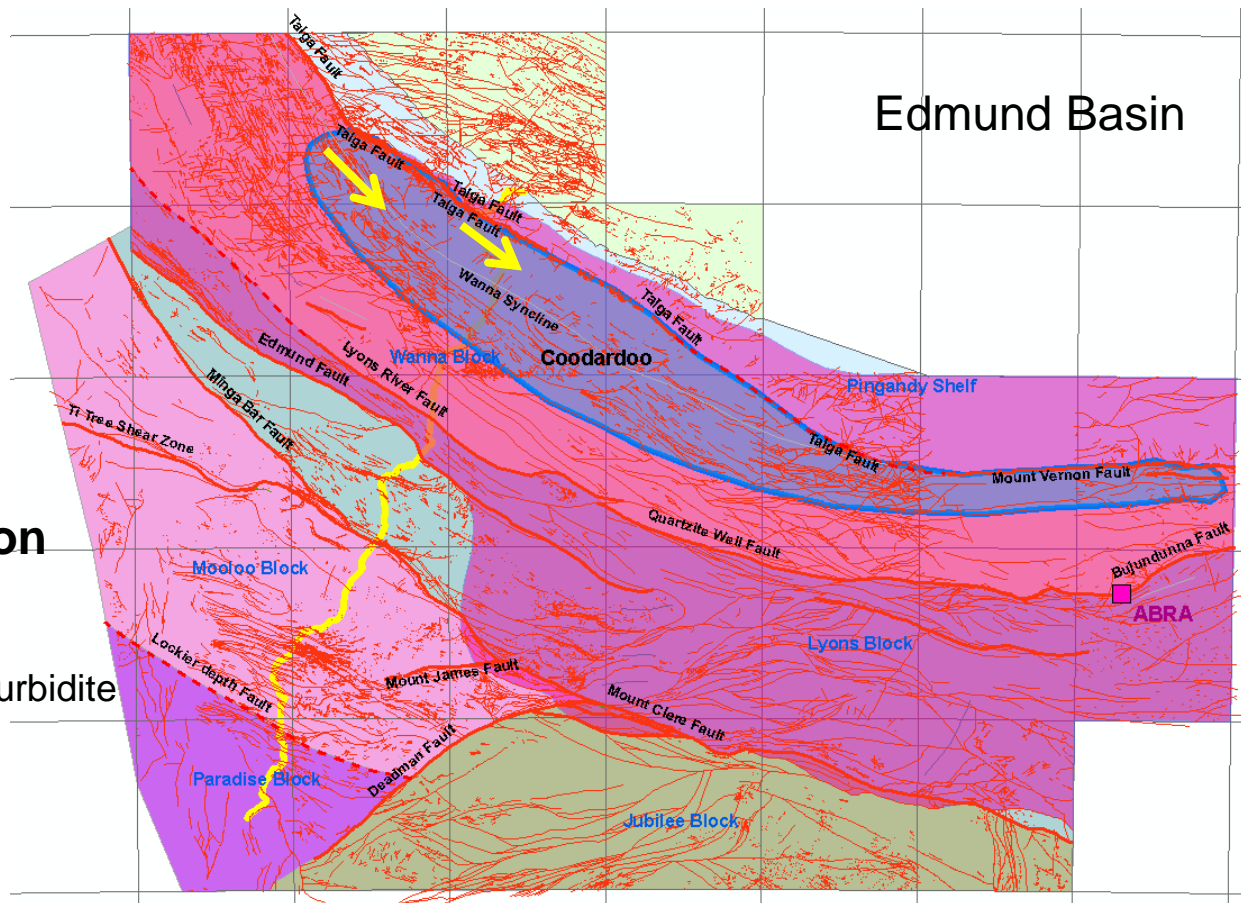


Package 4



FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgari Fm	6	COLLIER GROUP
Calyie Fm		
Backdoor Fm	5	EDMUND GROUP
Coodardoo Fm		
Ullawarra Fm	4	EDMUND GROUP
Devil Creek Fm		
Discovery Fm		
Muntharra Fm	3	EDMUND GROUP
Kiangi Creek Fm		
Cheyne Springs Fm		
Blue Billy Fm	2	EDMUND GROUP
Goorangora Fm		
Irregully Fm	1	
Yilgatherra Fm		

Bangemall Supergroup
Palaeoproterozoic Basement



Coodardoo Formation

- ~ 200 m of thick-bedded turbidite and mass flow sandstone.
- Sub-tidal slope to basinal environment

Hiatus : 1465 Ma – ?

FORMATION	DEPOSITIONAL PACKAGE	GROUP	
Ilgarari Fm	6	COLLIER	Bangemall Supergroup
Calyie Fm			
Backdoor Fm	5	GROUP	
Coodardoo Fm		EDMUND	
Ullawarra Fm	4		
Devil Creek Fm			
Discovery Fm			
Muntharra Fm	3	GROUP	
Kiangi Creek Fm			
Cheyne Springs Fm			
Blue Billy Fm	2		
Gooragoora Fm			
Irregully Fm	1		
Yilgatherra Fm			
Palaeoproterozoic Basement			

c. 1465 Ma – Top Edmund Group

- Ullawarra volcanoclastics
- Narimbunna Dolerite

c. 1070 Ma – Top Collier Group

- Kulkatharra dolerite
- Peperite texture (Backdoor Fm)



395 m.y. ?

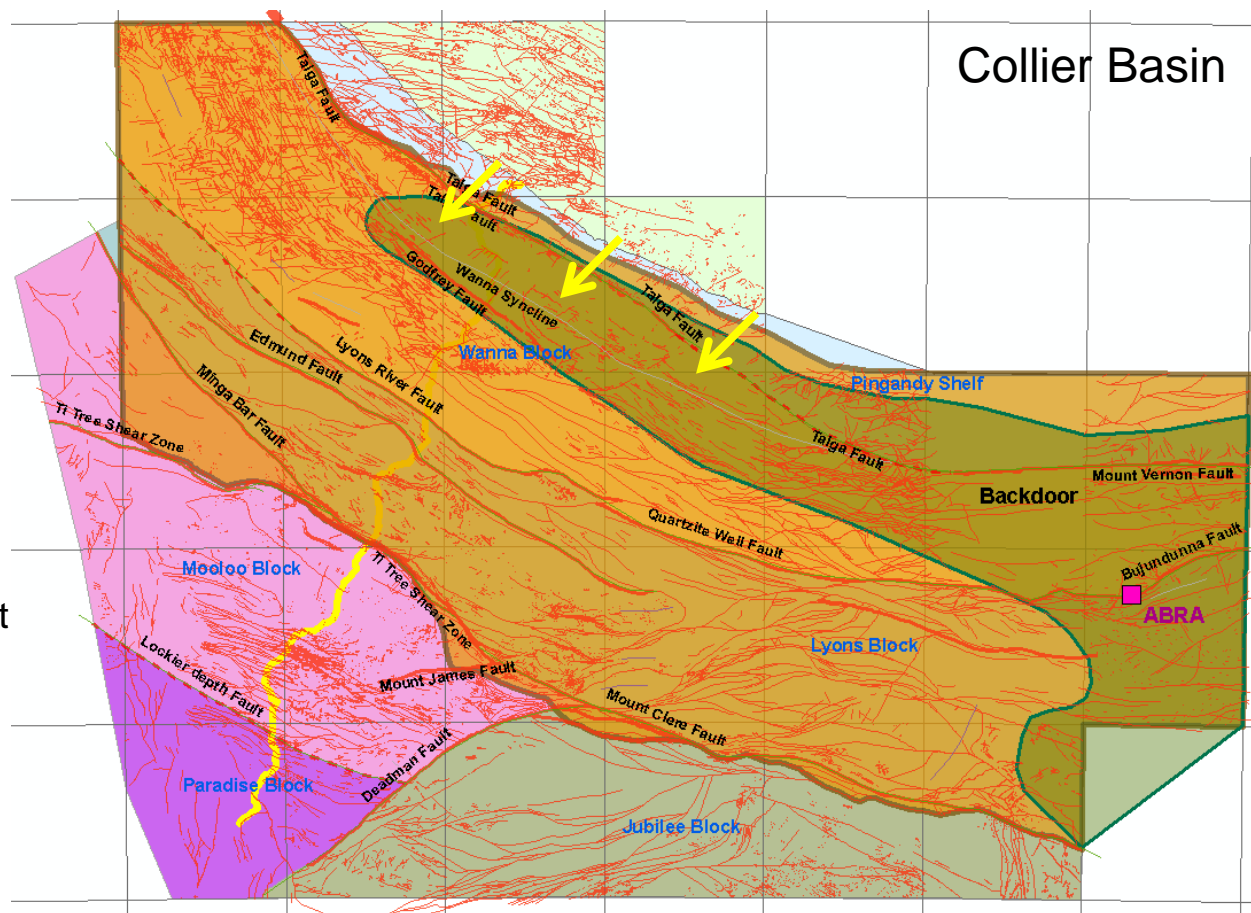
- Mutherbukin Tectonic Event

Package 5



FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgarari Fm	6	COLLIER GROUP
Calyte Fm		
Backdoor Fm	4	EDMUND GROUP
Coodardoo Fm		
Ullawarra Fm		
Devil Creek Fm		
Discovery Fm	3	EDMUND GROUP
Muntharra Fm		
Kiangi Creek Fm	2	EDMUND GROUP
Cheyne Springs Fm		
Blue Blitty Fm		
Gooraooora Fm	1	EDMUND GROUP
Irregully Fm		
Yilgatherra Fm		

Palaeoproterozoic Basement



Package 5

- Narrowing of basin in the west
- Widening of the basin in the east

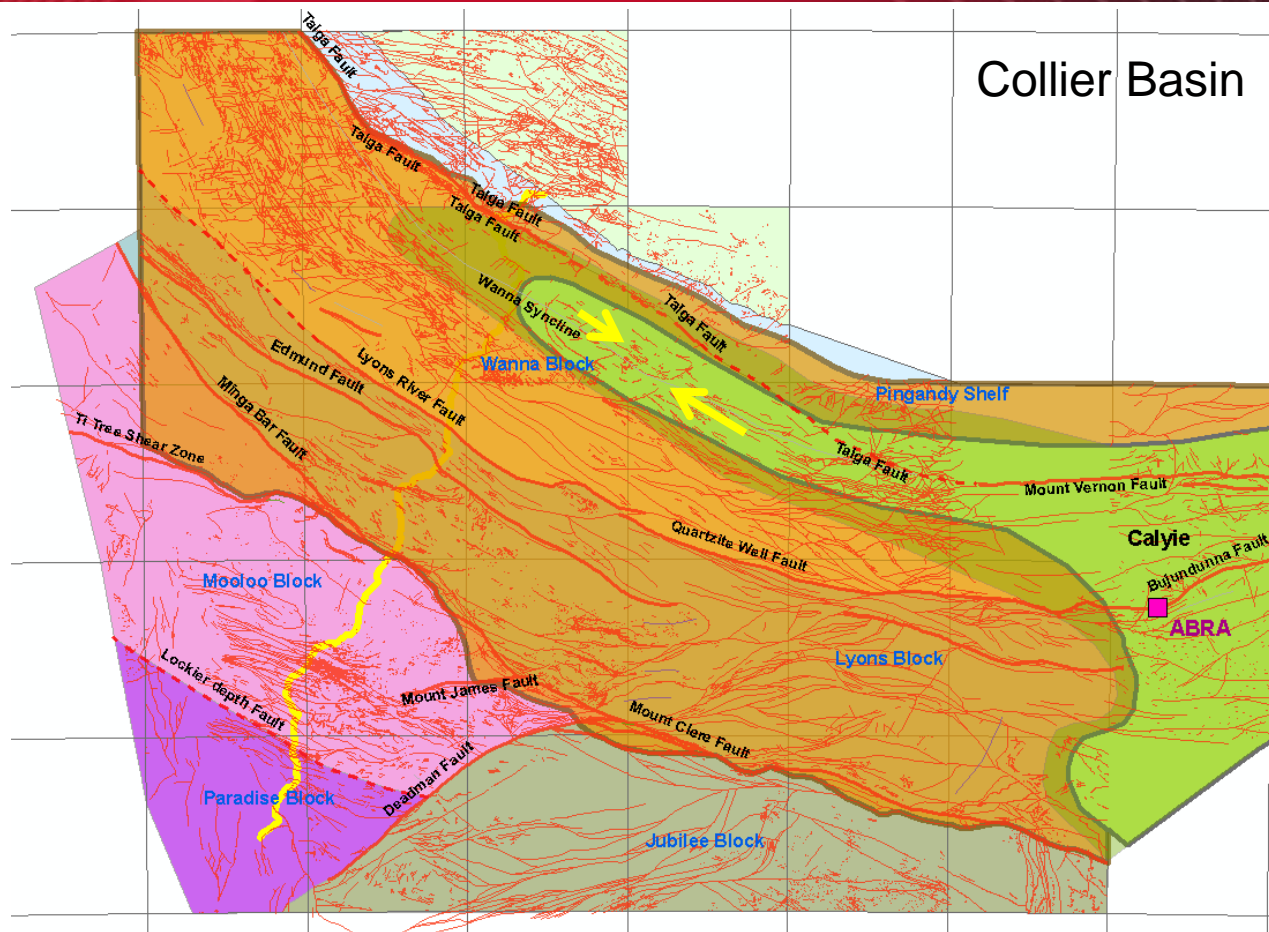
Backdoor Formation

- ~ 1500 m of laminated siltstone sandstone and dolomudstone
- Coarsening upward succession
- Increase in sandstone
- Marginal delta-front environment
- Sediment supply from the NE.

Package 5



FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgari Fm	6	COLLIER GROUP
Calyie Fm	5	
Backdoor Fm	5	EDMUND GROUP
Coodardoo Fm	4	
Ullawarra Fm	4	EDMUND GROUP
Devil Creek Fm		
Discovery Fm		
Muntharra Fm	3	EDMUND GROUP
Kiangi Creek Fm	2	
Cheyne Springs Fm		
Blue Billy Fm		
Gooraooora Fm		
Irregully Fm	1	EDMUND GROUP
Yilgatherra Fm	1	
Palaeoproterozoic Basement		



Calyie Formation

- ~ 200 m sandstone and siltstone
- Delta-top to delta-front environment
- Sediment supply along the basin axis

Package 6



FORMATION	DEPOSITIONAL PACKAGE	GROUP
Ilgarari Fm	←	COLLIER
Calyte Fm		
Backdoor Fm	5	GROUP
Coodardoo Fm	4	EDMUND
Ullawarra Fm		
Devil Creek Fm		
Discovery Fm		
Muntharra Fm	3	GROUP
Kiangi Creek Fm		
Cheyne Springs Fm		
Blue Bluff Fm	2	GROUP
Gooraooora Fm		
Irregully Fm	1	
Yilgatherra Fm		

Palaeoproterozoic Basement

Package 6

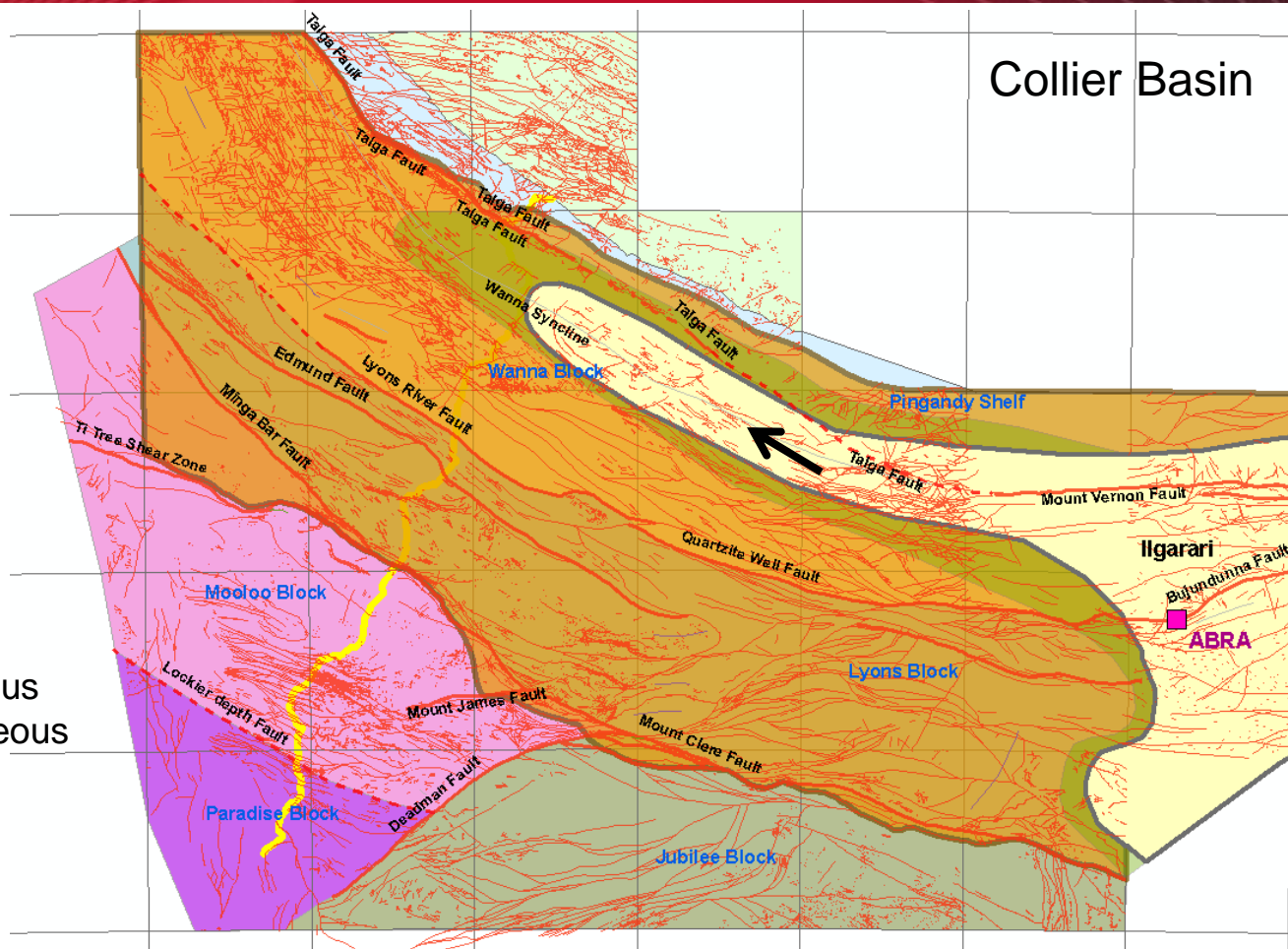
- Marine transgression

Ilgarari Formation

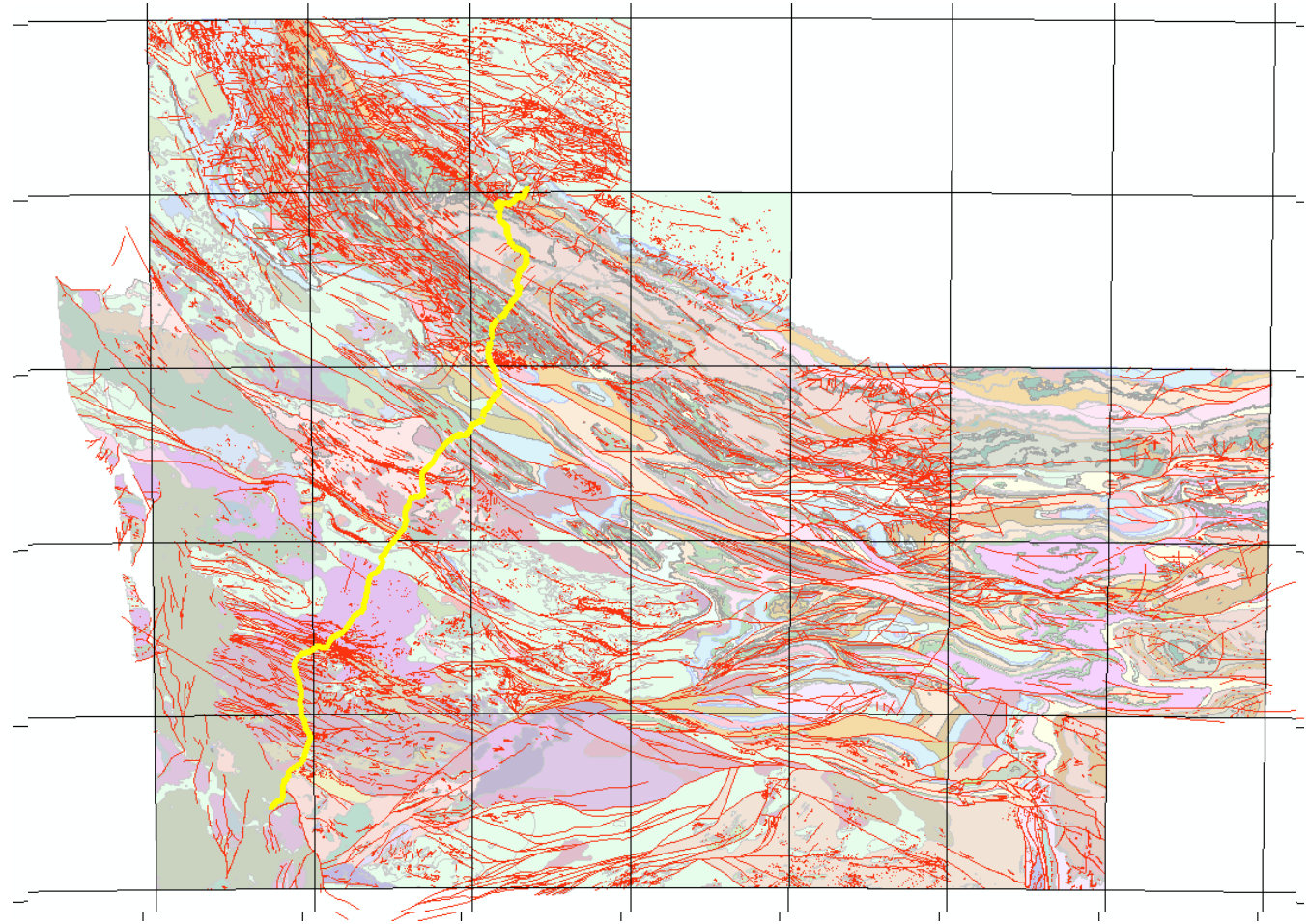
- 700 m pyritic and carbonaceous siltstone, sandstone, calcareous siltstone and chert
- Marine shelf environment
- Sediment supply from SE

Kulkatharra Dolerite

- c. 1070 Ma



Deformation events



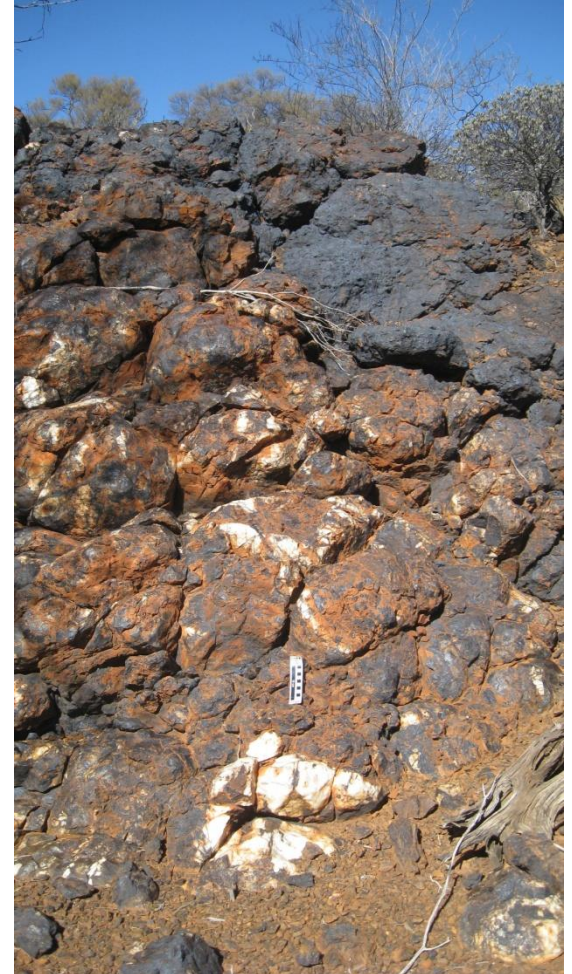
Fault offset



Deformation



Slickensides



Quartz ironstone
breccia

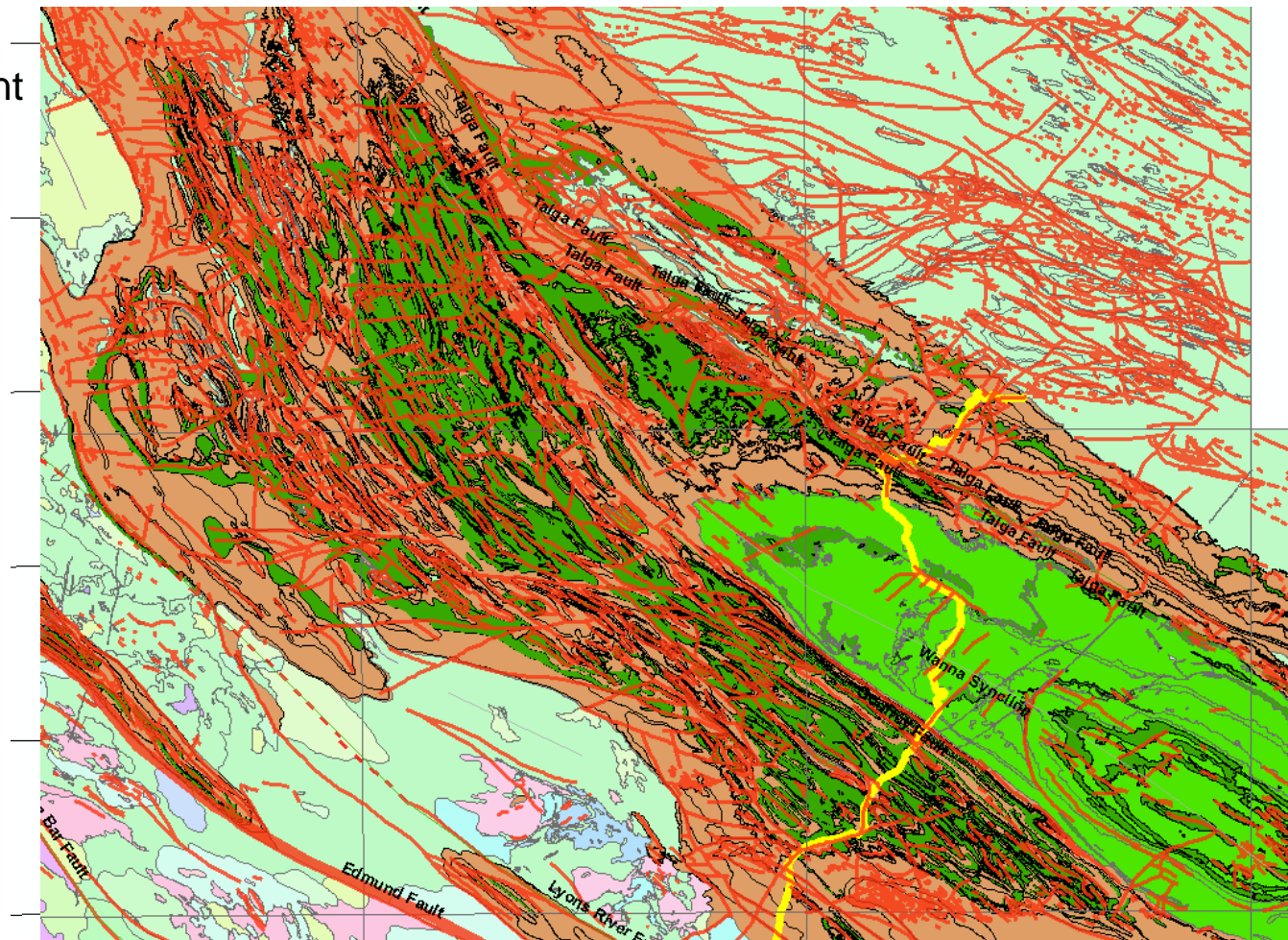
Deformation events



Mutherbukin Tectonic Event
(1385–1200 Ma)

Edmundian Orogeny
(1030–955 Ma)

Mulka Tectonic Event
(c. 570 Ma)



Mutherbukin Tectonic Event (1385-1200 Ma)



Hydrothermal monazite and xenotime
(1385–1300 Ma)(Rasmussen et al., 2010)

Pyrite – Re/Os
(c. 1265 Ma)(GSWA, unpublished data)

Edmundian Orogeny (1030-955 Ma)

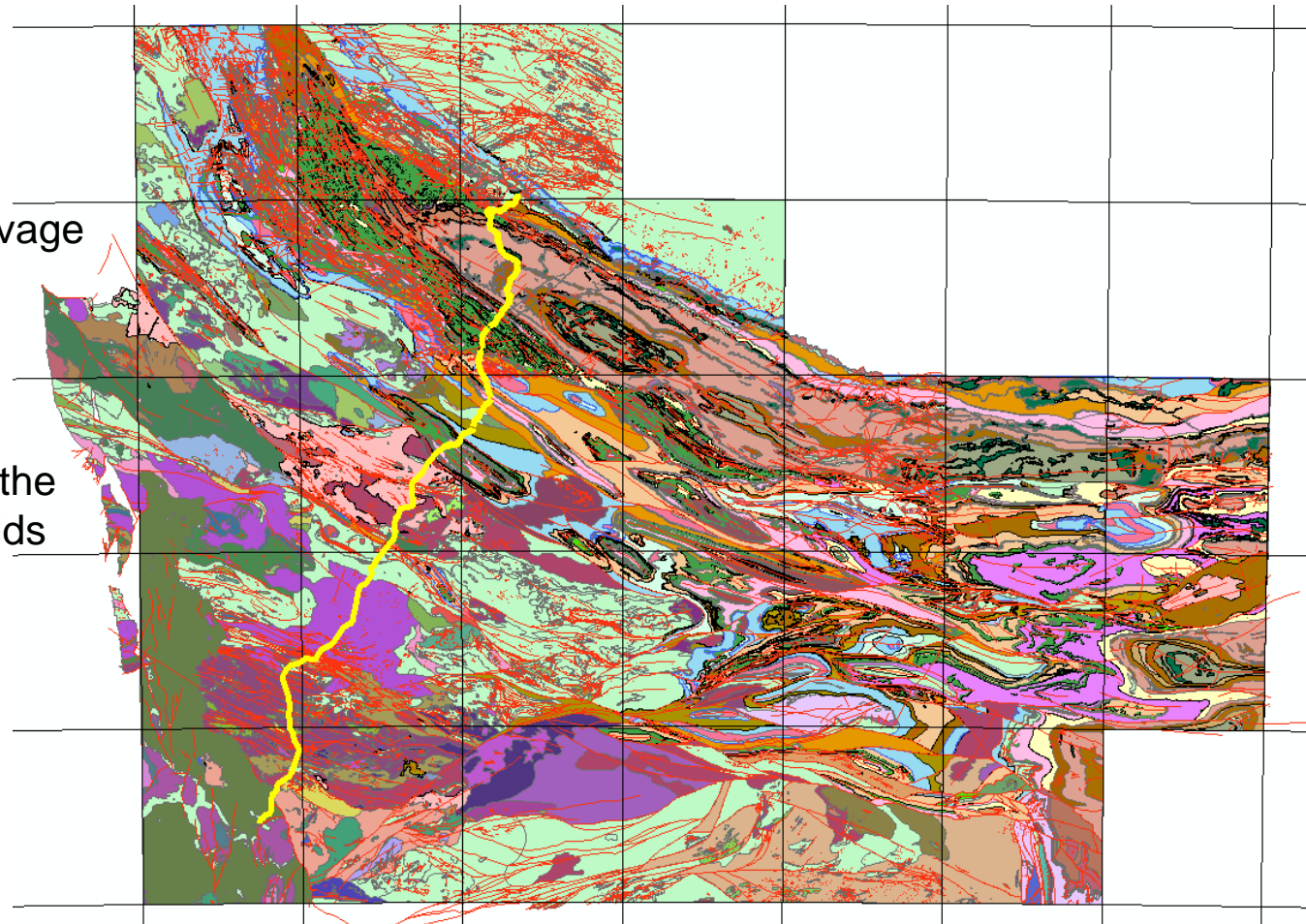


D_{1e}

- Reverse faulting and transpressive folding.
- Local axial planar cleavage
- NE-SW compression

D_{2e}

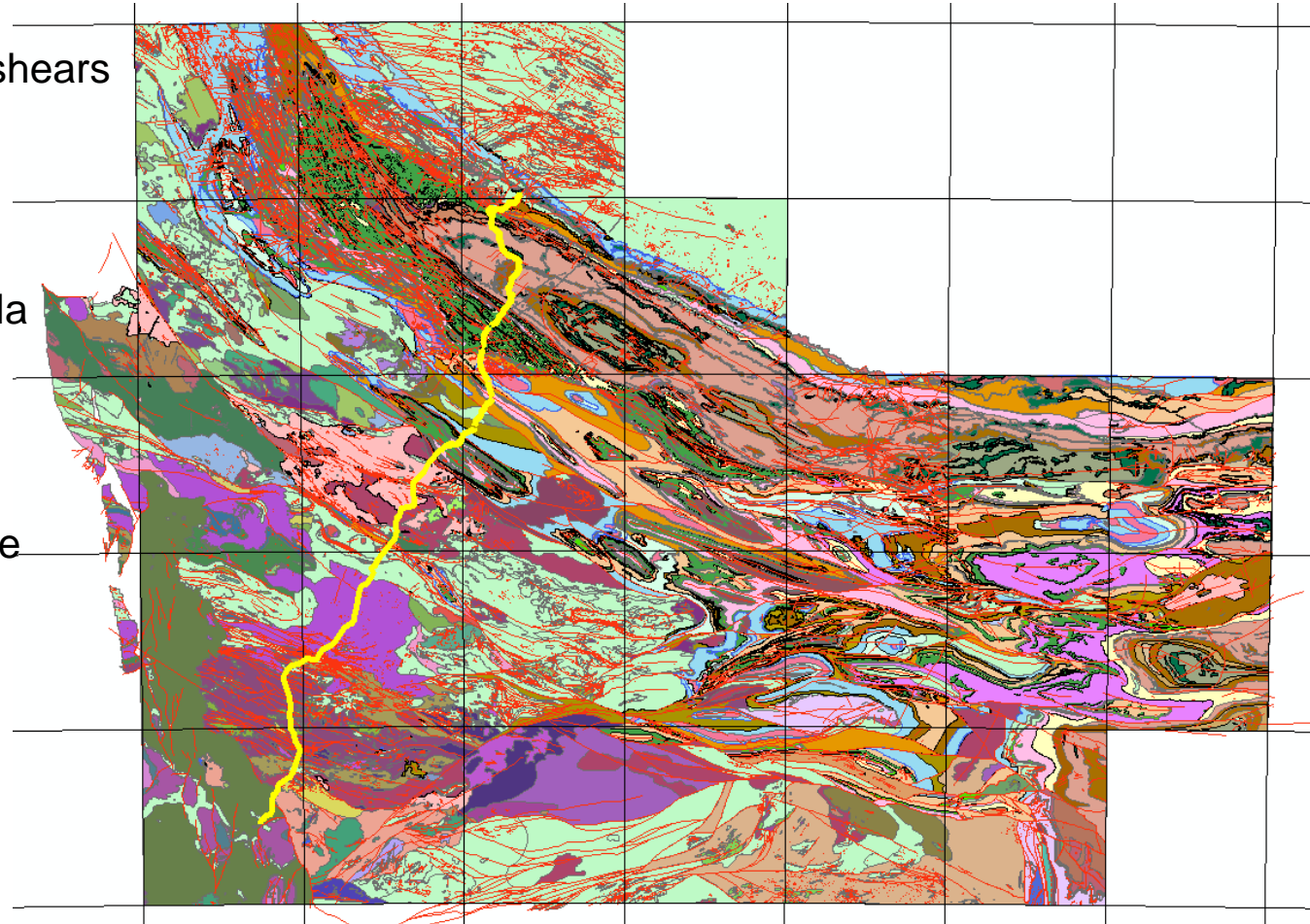
- Curvilinear bending of the axial traces of F_{1e} folds



Mulka Tectonic Event (c. 570 Ma)



- Brittle-ductile faults and shears
- Dextral strike-slip shear indicators.
- Dextral offset of c. 755 Ma Mundine Well dolerite dykes
- Dated c. 570 Ma from $^{40}\text{Ar}/^{39}\text{Ar}$ muscovite in a dextral shear zone

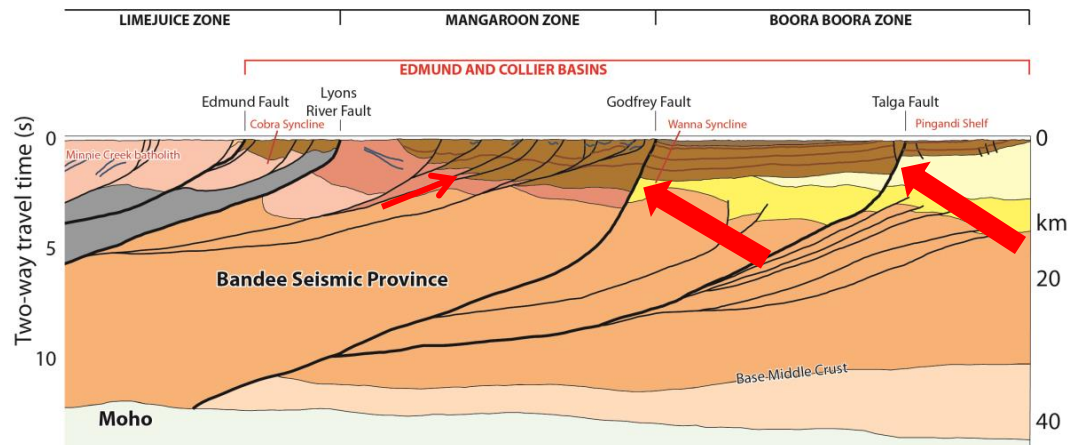
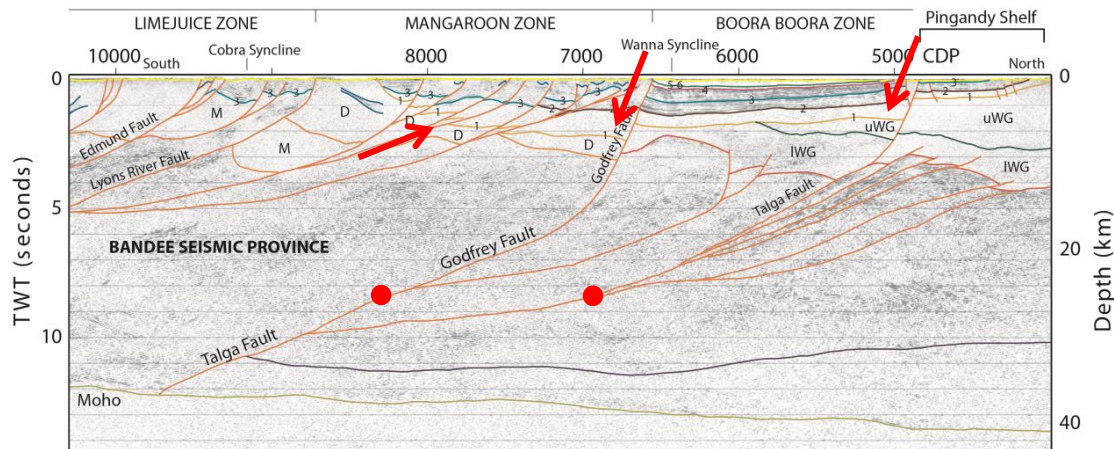


GA10-CP2:

CONCLUSION



- Listric normal faults facilitated deposition
- Reactivated basement structures
- Depth and thickness of depositional packages
- Edmund and Collier Basins a series of half-grabens
- Basin inversion by reverse transpression



Edmund and Collier Basins

