

Stratigraphic controls on distribution of facies in the Hermitage and Coxon Creek CSG Fields, Walloon Subgroup, Surat Basin

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Research Title: Short Range Permeability Project

AIMS OF THE STUDY

To date the lateral correlation of internal boundaries within the Walloon Coal Measures has been strictly based on lithology. This study utilizes sequence stratigraphic concepts to better understand the depositional architecture of the interval (Figure 3). The further integration of this interpretation with the available seismic data provides strong support for these boundaries. By placing the various coals within their depositional units lateral connections are better understood. The sequence stratigraphic methodology and nomenclature is similar in methodology to that employed on the North West Shelf of Australia (Longley et al, 1993).

BACKGROUND

Significant exploration and development of the substantive coal seam gas reserves in the Bowen and Surat basins (Queensland, Australia) over the last decade have provided a large quantity of data from 8,385 wells; 7461 have been spudded within the last decade with a peak of 1552 wells drilled in 2013. However, at the near well to inter-well scale, i.e. over a short range, the connectivity of fracture networks between adjacent wells and the predictability of their associated porosity and permeability remains a significant challenge to industry. In this context, short-range refers to typical inter-well distances of the order of 1000m.

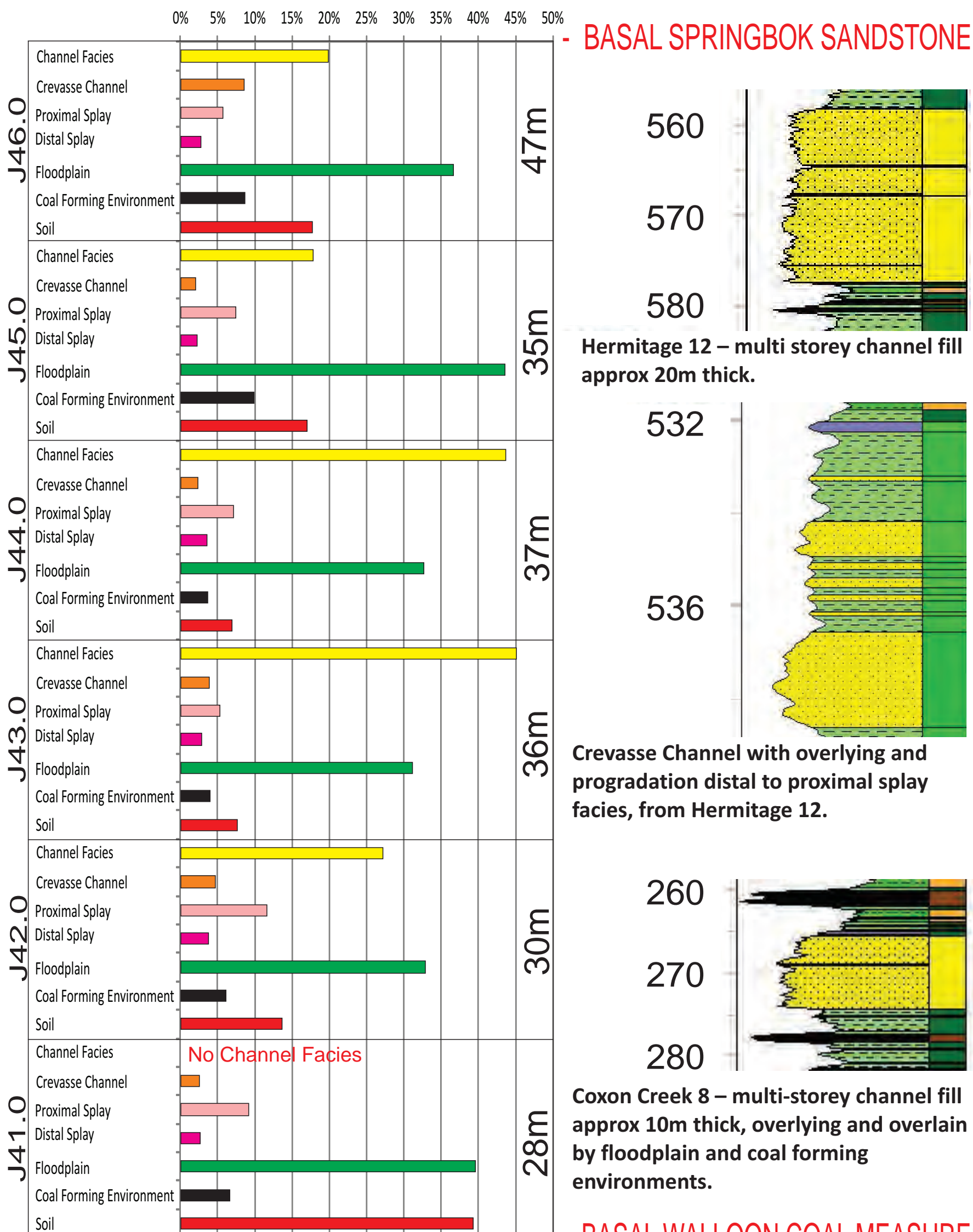
METHODOLOGY

Field Area -

- The Hermitage and Coxon Creek Fields are located approximately 40kms northeast of Roma, QLD (Figure 1).
- The field areas are separated by the North South trending Hutton-Wallumbilla fault.

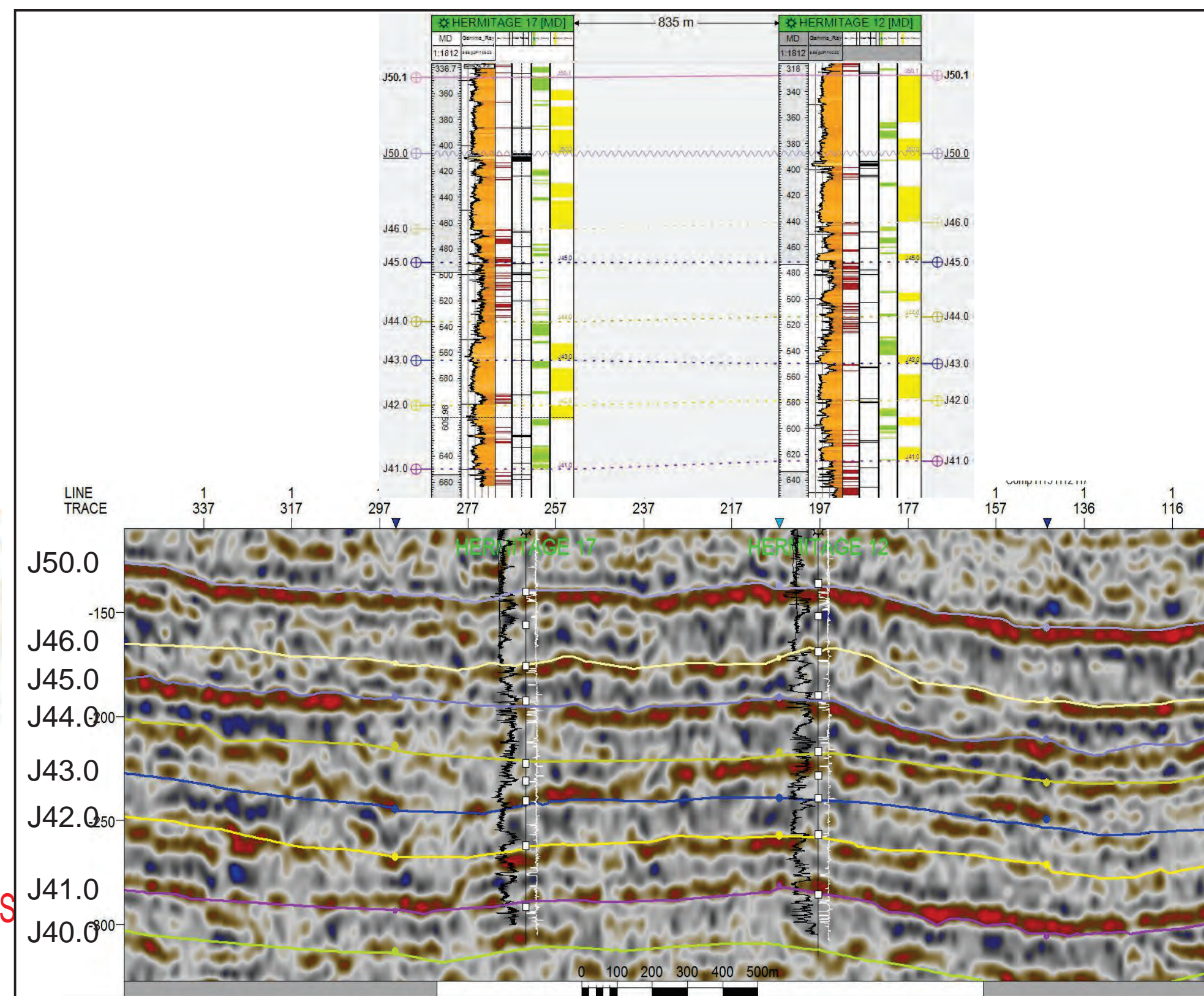
Lithology and Facies Associations

- Five lithologies (sandstone, siltstone, mudstone, coal and cement) were determined from the wireline data (Table 1).
- All wells are dominated by floodplain facies, which include distal coal forming and soil forming depositional settings, and more proximal crevasse splay settings.
- Main fluvial channel facies are also commonly observed with varying thicknesses from approximately five metres single storey events, to multi-storey channels in excess of twenty metres (Table 2).
- Thick coal accumulations are rare and interpreted soils (most likely immature) are common. The relative abundance Facies associations by stratigraphic interval provides an insight into the dominant depositional environments at different times during the evolution of the Walloon Coal Measures (Figure 2).

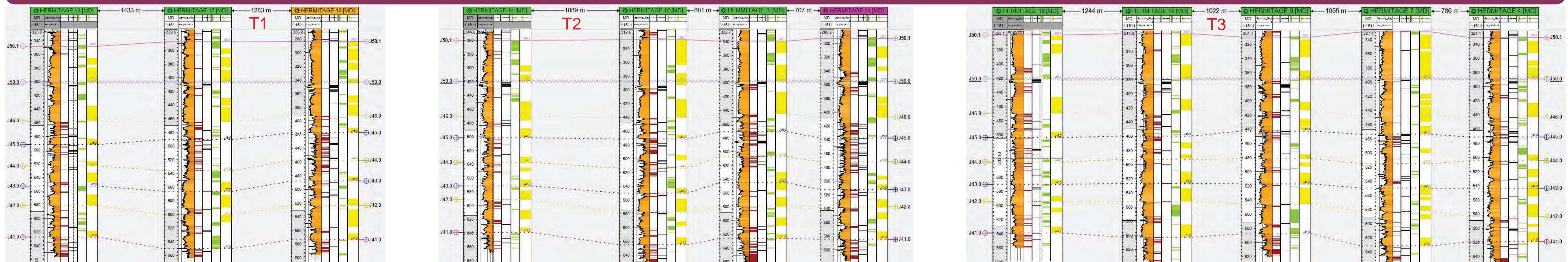


Facies Associations	Thickness Max (m)	Thickness Min (m)	Thickness Average (m)	Thickness (count)
Channel Facies	32.81	4.61	10.18	170
Crevasse Channel	5.99	0.62	2.70	95
Proximal Splay	4.25	0.01	0.46	1034
Distal Splay	4.65	0.02	0.28	682
Floodplain	9.42	0.01	0.64	3493
Coal forming environments	8.47	0.01	0.50	810
Soil	12.12	0.01	0.39	2371

Table 2 - Facies Associations bed thicknesses and occurrences. NB. Thick occurrences (max) are commonly the stacking of lithologies in multi-storey units. The thick occurrences of coal forming environments occur in Coxon Creek East 3 and is a thinning upward coal with siltstone interbeds. Likewise thick occurrences of channels facies represent multi-storey stacks of channels/channel belts. The average thickness is more representative of individual occurrences.



LATERAL CONTINUITY



STRATIGRAPHY OF THE SURAT BASIN - CHRONOLOGY AND SEQUENCE STRATIGRAPHY

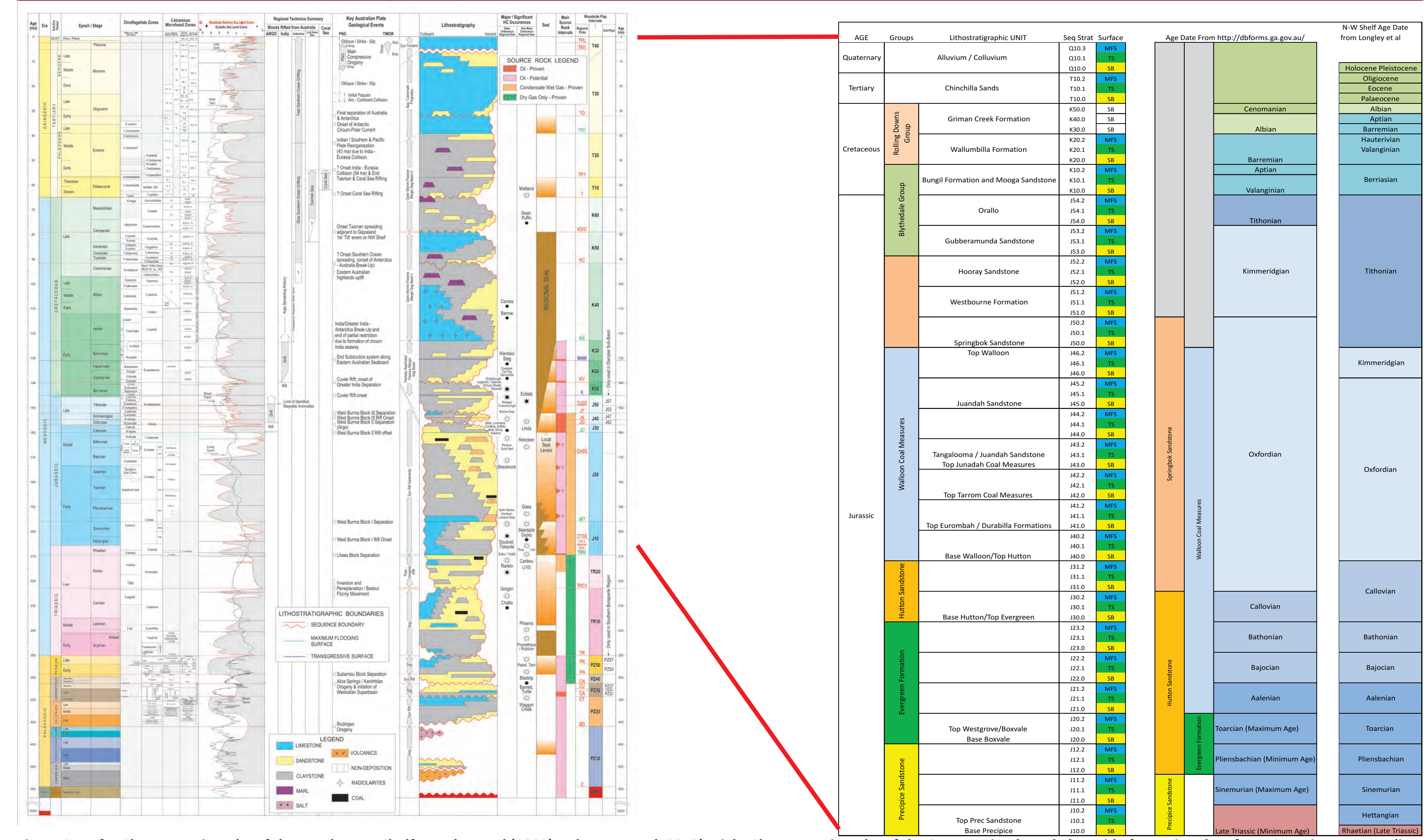


Figure 3 - Left - Chronostratigraphy of the North West Shelf, Longley et al (1993), Adamson et al, 2013) Right Chronostratigraphy of the Surat Basin plotted alongside formation data from Geoscience Australia (<http://dbforms.ga.gov.au/>) and summary of data from NWS.

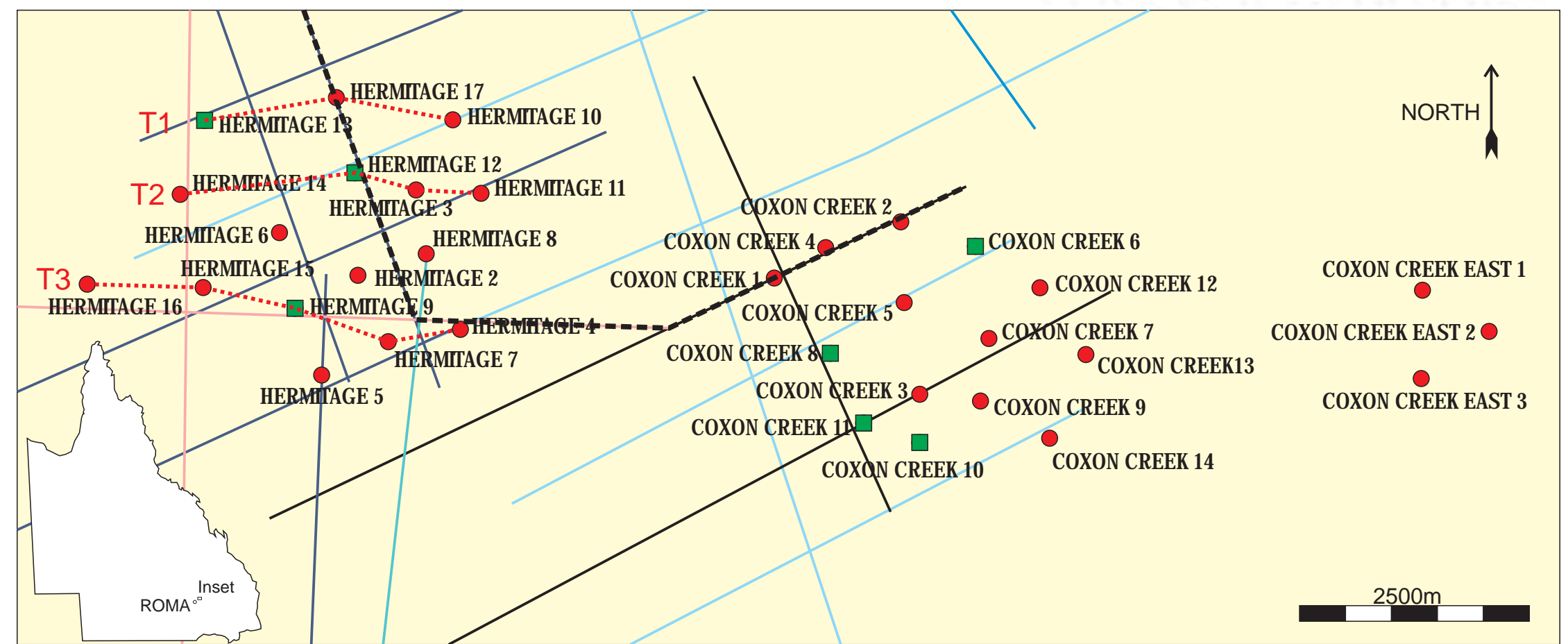
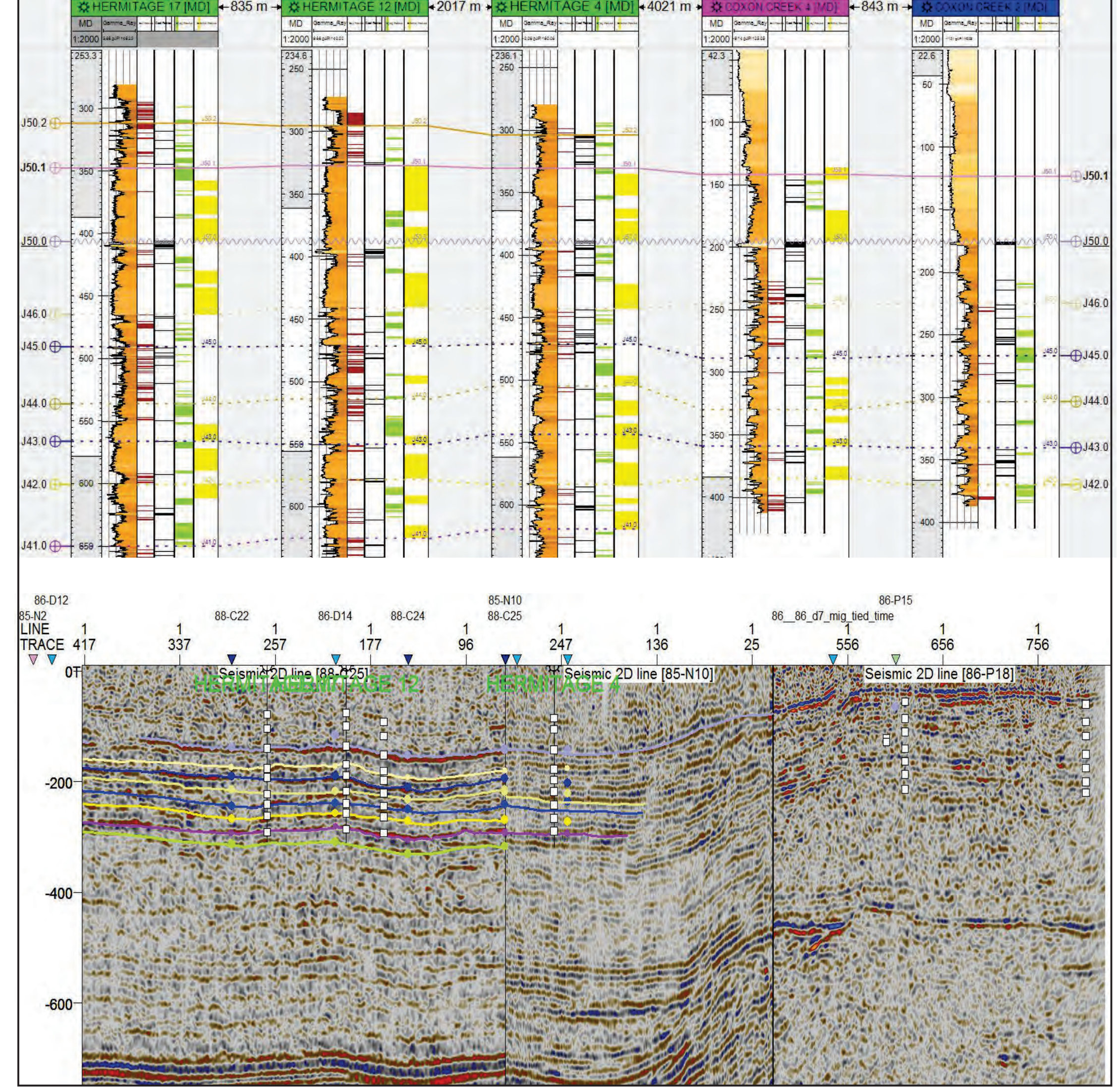


Figure 1 - Location of wells from the Hermitage, Coxon Creek and Coxon Creek East fields. The wells in green squares have flow tests. The coloured lines are individual seismic surveys, with the stippled line outlining the composite line below.

SEQUENCE STRATIGRAPHY ANALYSIS



- Sequence stratigraphic analysis was undertaken with a combination of interpreted 4th order sequence stratigraphic cycles supported by seismic reflector data between wells.
- Data in Hermitage correlated strongly where well data was tied to the seismic. The 88-C25 seismic line that runs alongside Hermitage 12 and Hermitage 17 was initially interpreted, with subsequent seismic surfaces correlated away from this line (Above).
- Previous interpretations from well section analysis correlated well with only minor adjustments to the interpretation (Sections T1, T2, T3).
- Data in Coxon Creek and Coxon Creek East were more challenging.
- Well to well correlations were difficult excepting the J50.0 surface at the top of the J46.0 interval.
- These surfaces were expressed well in the seismic, however cyclicity between the surfaces was less evident.

CONCLUSIONS

- Chronostratigraphic or sequence stratigraphic methodologies integrated with seismic data provide a robust framework for facies architecture.
- The facies architecture within the interpreted framework can demonstrate the lateral continuity and dis-continuity of particular facies, i.e. coal and channel, between immediately adjacent wells.
- Individual occurrences of coal facies are not always likely to be laterally extensive and connected.

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