



Regional Geology of the Browse Basin

Figure captions

- Figure 1** Location map showing the sedimentary basins of Australia's North West Shelf.
- Figure 2** Map of the Browse Basin showing bathymetry, petroleum well distribution and oil and gas fields.
- Figure 3** Seismic section (line BBHR07) across the Caswell Sub-basin highlighting the onlap of Mesozoic sediments on basement underlying the Yampi Shelf.
- Figure 4** Seismic section (line BBHR15) across the boundary between the Barcoo and Caswell sub-basins, highlighting the different thickness of the Mesozoic successions.
- Figure 5** Tectonic elements map of the Browse Basin showing bathymetry, petroleum well distribution, and oil and gas fields.
- Figure 6** Stratigraphic chart for the Browse Basin showing hydrocarbon occurrences. Based on the Browse Basin Biozonation and Stratigraphy Chart (Kelman et al, 2017). Geologic Time Scale after Gradstein et al (2020).
- Figure 7** Schematic cross-section (not to scale) depicting hydrocarbon play types in the Caswell Sub-basin within **a)** sequence stratigraphic context, and **b)** lithostratigraphic context.
- Figure 8** Map of the Caswell Sub-basin showing bathymetry, petroleum well distribution, oil and gas fields, and Ichthys to Darwin pipeline.
- Figure 9** Stratigraphic chart for the Leveque and Yampi shelves showing well intersections of hydrocarbons. Based on the Browse Basin Biozonation and Stratigraphy Chart (Kelman et al, 2017). Geologic Time Scale after Gradstein et al (2020).
- Figure 10** Stratigraphic chart for the Caswell and Barcoo sub-basins showing well intersections of hydrocarbons. Based on the Browse Basin Biozonation and Stratigraphy Chart (Kelman et al, 2017). Geologic Time Scale after Gradstein et al (2020).
- Figure 11** Map showing the current main operators, active exploration permits, retention leases and production licences.
- Figure 12** Map showing petroleum exploration permits, oil and gas fields and petroleum production facilities in the Browse Basin.
- Figure 13** **a)** Hierarchical cluster analysis for oil and condensate families in the Browse Basin (Edwards et al., 2016) and **b)** carbon isotopic data for individual hydrocarbons in natural gases and oils from the Browse Basin (Grosjean et al., 2015, 2016). These data highlight the source differences between the Cretaceous-sourced (K20-K30 supersequences) fluids, from Adele 1 (gas) and Kalypteia 1 ST1 (gas and oils), which are depleted in ^{13}C (green), with those of Jurassic-sourced fluids (J10-J20 supersequences) from the Scott Reef Trend, which are enriched in ^{13}C (orange), and fluids with intermediate composition from the Ichthys and Burnside accumulations that are interpreted to be sourced and sealed by the K10 supersequence (pink). Fluid from Crux 1 in the Heywood Graben is isotopically enriched in ^{13}C (blue). The supersequence labelled after the well name in the key is the reservoir.
- Figure 14** Petroleum systems modelling results for the K20-K30 supersequences (Echuca Shoals Formation), J30-K10 supersequences (Vulcan Formation) and J10-J20 supersequences (Plover Formation). Columns definitions are; **a)** net source rock thickness (m); **b)** transformation ratio (TR; mass fraction); and **c)** maturity (%Ro).

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- Figure 15** Petroleum systems modelling results for; **a**) K20-K30 supersequences (Echuca Shoals Formation); **b**) J30-K10 supersequences (Vulcan Formation); and **c**) J10-J20 supersequences (Plover Formation). Row definitions; 1) gas expelled (bcf/km²); and 2) oil expelled (mmbbl/km²).
- Figure 16** Hydrocarbon expulsion maps (oil + gas mmboe/km²) for; **a**) K20-K30 supersequences (Echuca Shoals Formation); **b**) J30-K10 supersequences (Vulcan Formation); and **c**) J10-J20 supersequences (Plover Formation). The extent of the modelled expelled hydrocarbons and known hydrocarbon accumulations is used to define the potential extent of the associated petroleum systems.
- Figure 17** Schematic cross-section through the Caswell Sub-basin, showing mappable sequences and key petroleum wells.
- Figure 18** Map showing marine reserves, marine parks, multiple use zones and ecological features in the Browse Basin.