CO_2 storage prospectivity of the offshore Vlaming Sub-basin – evaluating containment

Irina BORISSOVA[1], George BERNARDEL[1], Chris SOUTHBY[1], Megan LECH[1], Steven JOHNSTON[1], Nadege ROLLET[1], and Chris LEWIS[1]

[1]Geoscience Australia, irina.borissova@ga.gov.au

As part of the National CO_2 Infrastructure Plan (NCIP), Geoscience Australia is undertaking evaluation of the Vlaming Sub-basin, offshore Western Australia, for the long-term storage of CO_2. The Early Cretaceous Gage Sandstone is a quality reservoir unit in the sub-basin with an areal extent of >1500 km^2. It is overlain by up to 800 m of deltaic to shallow marine succession of the South Perth Shale (SPS) that forms a regional seal. Initial assessment of the seismic data identified recent fault reactivation and seismic anomalies potentially indicating hydrocarbon seepage, occurring after the deposition of the SPS. Seal quality of the SPS was tested in eight wells using Fluid Inclusion Stratigraphy (FIS). Six wells showed evidence of hydrocarbons migrating through the SPS, which indicates possible seal breach. However, detailed seismic mapping shows that SPS comprises highly diverse lithologies ranging from pro-delta shales to sandier topset facies. The best seal, interpreted from the seismic and well data, is generally confined to the paleo-depositional lows, where prograding units are thicker. A large number of the Vlaming Sub-basin wells were drilled on the paleotopographic highs and therefore the seal intersected at these wells is not likely to be representative of the whole sub-basin. The study suggests that the effective part of the seal is likely to be restricted to paleo-depositional lows in areas not affected by fault reactivation. The spatial relationship between the effective seal and reservoir will determine selection of areas suitable CO_2 storage.

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