

Influence of Early Cretaceous paleotopography on deposition and the sealing potential of the South Perth Shale, Vlaming Sub-basin

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Geoscience Australia is currently conducting a study under the National CO₂ Infrastructure Plan (NCIP) to assess suitability of the Vlaming Sub-basin for CO₂ storage. It involves characterisation of the potential seal, the Early Cretaceous South Perth Shale (SPS), by integrating seismic and well log interpretation into a sequence stratigraphic framework. The SPS, conventionally described as a regional seal deposited during a post-rift thermal subsidence phase, consists of a series of prograding units deposited in a deltaic to shallow marine setting. Mapping of the SPS has revealed differences in the geometries of progradational sequences between the northern and southern areas, related to the type and distance to the sediment source as well as the seafloor morphology. In the northern area, deltaic progradation and aggradation occurred over a flat topography between the two uplifted blocks. The succession is composed of prograding sequences commonly exhibiting sigmoidal to oblique geometries, prograding from the north-east to south-west. In the southern area the topography is more complex due to the presence of several paleotopographic highs associated with pre-existing structures. These sequences are sigmoidal to oblique in cross section. They were deposited in fan shaped lobes, successively infilling paleotopographic lows. Direction of the progradation is from southwest to northeast. The thickness of the SPS varies from 200m between topographic highs to 700m in the lows. Sedimentary facies are interpreted to vary from sandy delta front to muddy slope and prodelta deposits. These findings will be used in a 3D geological model for assessing CO₂ storage potential.