

Rich Oil-Prone Ordovician Source Beds, Bongabinni Formation, Onshore Canning Basin, Western Australia

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Excellent quality source rocks have been intersected in cored mineral exploration drill holes in the lower part of the Middle–Late Ordovician Bongabinni Formation (Carribuddy Group) along the Admiral Bay Fault Zone (ABFZ), SW onshore Canning Basin. This is significant for local petroleum prospectivity because the regionally most important Ordovician source horizons in the older Goldwyer Formation are of poor quality in this area.

The source beds are distributed over an interval up to 35 m thick and are interbedded between pyritic grey-green calcareous and dolomitic mudstone, argillaceous limestone and dolostone. The lack of macrofossils and bioturbation, but sparse evaporite minerals suggests periodic hypersaline conditions. The source beds, individually up to 1 m thick, are dark brown, laminated, and have a coal-like appearance.

Our detailed geochemistry of core from CRAE DD86SS3 and DD88SS9 confirms the presence of very rich, oil-prone source beds (organic richness: 4–62% TOC, generating potential: 13–159 mg/g S1+S2, hydrogen indices: 165–926). Previous biomarker and petrological studies demonstrated a marine algal source, extensive bacterial alteration, and genetic links to live oils extracted from wells along the ABFZ.

The inferred depositional environment is a lagoon with tenuous marine connection to the west, and variable salinity. Elsewhere the Bongabinni Formation is dominated by oxidised supratidal sediments. Lagoon localisation was probably controlled by tectonic activity along the ABFZ. Future work will focus on refining the distribution and lateral variation in character and quality of these source rocks and their host facies.