A Revised Distribution of Mesozoic Sediments and Its Implications on Play Type Elements and Interpreted Leads Within the Orphan Basin, Offshore Newfoundland and Labrador, Canada

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ABSTRACT

The Orphan Basin has recently re-emerged as an area of exploration focus in the offshore Newfoundland and Labrador, Canada. New interpretations and insights attained from extensive systematic data acquisition programs, including 65,000 line kilometres of broadband 2D seismic, as well as new exploration drilling, have resulted in new insights into regional basin understanding. The increased data density led to several changes including Jurassic intervals encountered in the centre of the Orphan Basin that have been extended through mapping, and stratigraphic play types not clearly defined by vintage seismic data. Early interpretations had the Orphan Basin divided into eastern and deeper western sub-basins. This division was mainly defined by the 'White Sail Fault' together with NE-SW trending basement ridges. It was also suggested that the west Orphan rifted later than the eastern side, and since no Jurassic sediments were observed in early wells, it was inferred that no Jurassic sediments were deposited west of this division. In recent years the Eastern portion of the basin saw drilling activity where Great Barasway F-66, Lona O-55 and Margaree A-49 drilled thick Jurassic section – with F-66 containing Tithonian and Kimmeridgian source rock intervals. However, determining the full extent of the Jurassic sediments was still limited due to the lack of data coverage. More recently it was interpreted , using refraction/wide-angle reflection and deep near-incident seismic reflection data, that syn-rift Jurassic sediment extends fully across the Orphan suggesting an earlier rifting age than previously determined. Earlier rifting of the Orphan Basin, and extensive presence of Jurassic sediments, has major implications on play type elements and interpreted leads. Examples of hydrocarbon migration from interpreted Jurassic sediments is evident throughout the basin, and is sourcing Late Jurassic, Early and Late Cretaceous and Paleogene leads and prospects. Interpreting the expanded 2D seismic data over the Orphan Basin has led to a revised understanding of the area's structural elements that shaped the rifting and depositional history. The initial concepts defining the division of the basin, with limited Jurassic sediment west of this division, are not consistent with current interpretations.