

Paleoenvironments and reservoir charecterization of the Middle to Late Permian Wargal Formation, NW Paksitan: Implications for hydrocarbon exploration

Sajjad Khan^{1,3}, Sajjad Ahmad², Muhammad Hanif³ and Irfan U. Jan³

¹Geoscience Advance Research Laboratory, Geological Survey of Pakistan Islamabad

²Department of Geology, University of Peshawar

³National Centre of Excellence in Geology, University of Peshawar

Permian rocks of Pakistan are the prolific hydrocarbon reservoirs and are productive in all parts of the Indus Basin, particularly, in the upper Indus Basin (i.e. Chak Naurang, Dhulian, Dhurnal, and Meyal oil fields). Carbonates of the Middle to Late Permian Wargal Formation constitute important petroleum reservoirs in the Salt Range area (of the upper Indus Basin). Elsewhere, e.g. in the North Sea, the use outcrop data and microfacies analysis techniques for constructing the dynamic depositional models has significantly increased the knowledge to characterize reservoir rocks. In this study we carried out a detailed microfacies analysis of the Wargal Formation and reconstructed the depositional settings which ranges from marine nearshore, intertidal to shallow subtidal environments, with energy conditions ranging from moderate to high. The important diagenetic processes recognized are bioturbation, micritization, dissolution, silicification, cementation, dolomitization, fracture fillings, chemical compaction, and secondary porosity development. The diagenetic fabrication and quantification of the porosity/permeability values suggest that facies of the Wargal limestone possess a high reservoir potential.