Lithofacies-based depositional environment and Reservoir Characterization of the Lumshiwal Formation, Surghar Range, Pakistan

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Rock samples from the Lumshiwal Formation exposed in Pannu Nala and Karandi Nala have been collected near Malla Khel area in Surghar Range for analyzing its depositional environment, geochemistry, lithofacies and reservoir potential. The lower contact of the Lumshiwal Formation with the Chichali Formation is transitional, and it is unconformably overlain by the Paleocene Hangu Formation. The thickness of the formation at the study area is 190m. Field investigation suggests that the formation is thinning in an easterly trend along the EW transect of the Surghar Range. The formation is composed of fine to medium-grained sandstone mostly, though a few sections exhibit medium to coarse grains, almost devoid of fossils. Belemnite fossils were noted in the lowermost layers of the formation. Sandstones within the Lumshiwal Formation are categorized as sub- arkose to arkose arenite based on their modal composition, with some samples designated as lithic arkose. Based on the lithofacies studies and geochemical studies (XRD studies), the depositional environment for the Lumshiwal Formation is Transitional that is ranging from Deltaic to shallow marine. Furthermore, the formation shows enrichment in carbonaceous material, with coal seams observed at multiple intervals. Overall, the formation exhibits general porosity, permeability, and moderate cementation, displaying characteristics indicative of the potential reservoirs for hydrocarbon accumulation within the region.