

# **Paleotopographic and Depositional Environment Control on “Sweet Spot” Locations in Unconventional Resource Shales**

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## **Abstract**

Both the Woodford Shale (Oklahoma, U.S.A.) and the Barnett Shale (Texas, U.S.A.) are prolific unconventional resource shales. Both sit atop unconformities on the surface of underlying carbonate rocks. There is variable topographic relief on the unconformity surfaces due to incised valley and/or karst formation during periods of subaerial exposure resulting from lowered sea level. Anomalously high thicknesses of the shale can form within these topographic depressions, giving rise to potential ‘sweet spots’ as drilling targets. Additionally, these shales often exhibit basal intervals of high gamma-ray log response, indicative of high organic matter (TOC). It is likely that the topographic relief that is formed during subaerial exposure creates areas of restricted marine circulation during early rise in sea level, and subsequent, localized anoxic depositional environments conducive to preservation of organic matter. It is possible that during the time after unconformity formation and prior to marine encroachment into incised valleys, lacustrine environments may form, which would be sites for earliest accumulation of organic-rich mud.