Bed-Scale Facies Architecture of Coastal-Plain Channel and Overbank Deposits in a Tight-Gas Reservoir Analog: Cretaceous Blackhawk Formation, Wasatch Plateau, Utah

Sahoo, Hiranya [1]; Gani, Royhan [1]; Hampson, Gary [2]; Gani, Nahid DS [1]; Jewell, Thomas O.[2]; Ranson, Andrew [1] (1) Earth & Environmental Sciences, University of New Orleans, New Orleans, LA. (2) Earth Science and Engineering, Imperial College, London, United Kingdom.

Using photomosaics, measured sections, and GPR data, this study characterizes various scales of lithological heterogeneity in the coastal-plain deposits of the Blackhawk Formation along the eastern Wasatch Plateau, central Utah, which is an outcrop analog for producing tight-gas reservoirs in the adjacent Uinta and Piceance Basins. The eastern Wasatch Plateau forms a continuous, 100-km long escarpment, oriented sub-parallel to regional depositional strike. Here we present detailed sedimentological data from the lower Blackhawk Formation (~100 m thick) along cliff faces that expose ~500 m of dip-section and ~150 m of strike-section in Cottonwood Creek. Several other nearby, longer cliffs were also studied. Large-scale heterogeneity is associated with alternating fluvial channel sandbodies and coastal-plain mudstones. Vertical amalgamation of individual sandbodies increases the net sandstone thickness locally, whereas lateral amalgamation increases the sandbody widths. Intermediate-scale heterogeneity within individual sandbodies is related with the development of various architectural elements like bar-accretion and crevasse splays. Considerable facies variations within individual architectural elements generate small-scale heterogeneity.

Individual channel sandbodies are 2 to 15 m thick, medium-grained, and contain predominantly dune cross-stratification and subordinate ripple cross-lamination, with paleocurrents directed towards the north and northeast. Lateral-accretion surfaces are distinctly developed and abundant, emphasizing the meandering nature of individual channels that produced sheet-type sandbodies. Along lateral-accretion beds, finer-grained sandstones become distinctly coarser-grained and amalgamated downdip. In convex-up crevasse-splay elements (c. 7m thick), individual beds show lateral facies change from proximal, ripple-laminated sandstones to distal, silty mudstones over a length of c. 20 m.

Moreover, outcrops in Cottonwood Creek demonstrate a general correlation between coal and overlying channel sandbody thickness. Locations where thicker coals were deposited likely experienced higher subsidence due to the high compaction-factor of coal-precursor peat. This differential subsidence generated long-lived topographic depressions above thicker coal. Channels likely repeatedly reoccupied the axes of such topographic depressions, resulting in thicker and more amalgamated channel sandbodies.