

Sedimentology and Stratigraphy from Measured Outcrop Sections on the Athabasca River: Grand Rapids, Joli Fou, Pelican, Westgate, Fish Scales and Belle Fourche Formations

D.C. Hay*, C.J. Banks and G.J. Prior

Alberta Geological Survey, ERCB, Twin Atria Building, 4999 - 98th Avenue, Edmonton, Alberta

*Duncan.Hay@ercb.ca

Abstract

Correlating lithostratigraphic formations in exposure-poor areas adds significant uncertainty when mapping on a regional scale. In the relatively poorly exposed Colorado Group, we present data on three measured sections from outcrops along the Athabasca River, north-east Alberta with natural gamma radiation logs measured from outcrop. Combined, the sections traverse the stratigraphy of the Grand Rapids (Mannville Group), Joli Fou, Viking/Pelican, Westgate, Fish Scales and Belle Fourche formations (all Colorado Group). The Grand Rapids Formation is represented by stacked coarsening-upward paracycles of paralic shale to fluvial sandstone dominated by trough cross-bedding. Only the basal part of the overlying Joli Fou Formation is exposed but it comprises two metres of dark grey, silty mudstone. The lower part of the Pelican Formation consists of coarsening-upward cycles of sandstone and siltstone interbedded with mudstone, which we interpret as inner shelf to lower shoreface deposits. The upper part is dominated by a 7m-thick prominent cliff-forming sandstone with swaley and hummocky cross-stratification, indicating a lower shoreface environment. The sharp base of the overlying siderite-cemented, pebble-bearing, coarse-grained sandstone is wave-rippled. This sandstone unit is overlain by the Westgate Formation, which is dominated by sulphur-stained, dark grey marine shale with occasional fish scales. A prominent, indurated 10cm-thick bioclastic bed with a very high gamma-ray count marks the base of the Fish Scales Formation. Two, 1-2cm-thick bentonite beds are observed in the otherwise shale-dominated Fish Scales Formation. The contact between the Fish Scales and Belle Fourche Formations is not exposed but we present cross-sections from subsurface mapping that predicts the boundary to lie in the non-exposed area on one of the sections. The incompletely-exposed Belle Fourche Formation is shale-dominated with silty lenses but coarsens-upward to a siltstone with interbedded sandy siltstone lenses towards the top of the section. Combined, these sections provide an important framework for updating the current geological map of Alberta.