

Lithofacies Analysis and Depositional Scenarios for the Rock Creek Member and “Niton B” Sandstone of the Fernie Formation in West-central Alberta

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Abstract

The Fernie Formation in the subsurface of west-central Alberta was deposited as a mixed carbonate-siliciclastic wedge upon a west-facing homoclinal ramp. Deposition spans a period of ~50 Ma and includes Hettangian through Kimmeridgian stages of the Jurassic System. Within the Fernie Formation the Rock Creek Member and “Niton B” sandstone are hydrocarbon-bearing units with complex lithostratigraphic relationships, and their depositional environments are the subjects of much debate. Based on forty cores, this study examines strata within the Poker Chip Shale, Rock Creek Member, “Niton B” sandstone, and the “Upper Fernie” shale through detailed lithofacies analysis, petrographical examination and geophysical well log correlation. Palynological studies in published reports from around the study area, and regional correlations to units with ammonites, indicate that a significant unconformity separates the lithologically distinctive “Niton B” sandstone (Upper Jurassic) from older units of the Rock Creek Member (lower Middle Jurassic) in the Niton Field. This means that it is a distinct younger unit of the Fernie Formation, now known informally as the “Niton B” sandstone, which is distinguished in part by the presence of a green mineral that is under study – the glauconite of previous reports.

Lithofacies within the Rock Creek Member include: coquinas and ‘wispy’ flaser-bedded sandstones with couplets and bundles, wavy to lenticular beds that grade into mudstones with *in situ* bivalves, current-bedded, fully marine sandy, bioclastic limestones, and current- to planar-bedded sandstones with macroburrows diagnostic of the *Cruziana* and *Skolithos* ichnofacies. Lithofacies within the “Niton B” sandstone are less variable and include well bioturbated to churned sandstones and current-bedded sandstones. These lithofacies are arranged in characteristic vertical successions that are suggestive of shoreface and tidal depositional environments. A shallow/marginal marine interpretation for the Rock *GeoConvention 2012: Vision 2*

Creek Member and the “Niton B” sandstone is further supported by the observation of pedodiagenetic features such as illuviated clays and root structures. These and other features of early diagenetic alteration have not been previously reported in the literature for this interval.