

The Lower to Middle Triassic Toad Formation (Montney-Doig equivalent) in northwestern Halfway River map area (94B/14)

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Summary

Approximately 600 meters of calcareous siltstone and fine sandstone belonging to the Toad Formation were measured immediately south of Halfway River, within the north western part of the Mount Laurier map sheet (94B/14). Semi-continuous chip samples were collected every 5 meters for Rock Eval analysis together with a representative sample suite for thermal maturation determination via reflective microscopy. A sample set was also chosen for semi-quantitative x-ray diffraction analysis. In addition, spectral gamma ray measurements were obtained every metre.

The Grayling Formation and basal 200 meters of the Toad Formation are covered in this area. The Toad Formation comprises a coarsening upwards succession of distal turbidites which become more proximal within the upper-most part of the succession. The lower 140 meters of the measured succession is dominated by uniform dark, calcareous to dolomitic carbonaceous siltstone which locally displays faint laminar bed forms. This sequence is followed by a repetitive section, some 200 meters thick, containing metre-thick beds of slightly coarser and cleaner dolomitic siltstone displaying laminar and graded bedding. The upper 250 meters of the succession records a greater influx of coarser siltstone with a corresponding decrease in carbonaceous content. Thinly laminated and graded sequences of coarse siltstone to very fine sandstone is common together with metre-thick successions of cleaner, fine sandstone containing current ripples and soft sediment deformation. These increase in abundance up section until the base of the Liard Formation, designated by continuous thin to thickly bedded fine to medium sandstone. The base of the Liard Formation also corresponds to the first appearance of bioturbation.

Rock Eval data indicate that the lower 200 m of the measured Toad section contains the highest levels of total organic carbon (TOC), with several 10 m sections having levels of between 3 and 4 %. The following 200 m returned TOC values of between 2 and 3 %, and the upper most 200 m containing less than 1 % TOC. Considering the high thermal maturity of these rocks (upper dry gas window) these sediments were considerably richer in organic matter prior to maturation.

Thin section examination of representative samples indicates that the darker siltstone samples contain, on average, up to 30 % carbonate. Siltstone and fine sandstone are dominated by angular to semi-rounded quartz with up to 20 % feldspar (potassium feldspar and plagioclase) followed by mica, chert and minor mafic minerals (hornblende).

Comparisons of gamma ray patterns obtained across the outcrop with subsurface sections immediately to the east suggest correlation of these rocks with Montney and Doig formations, as postulated from regional correlations. This is based primarily on the presence of a relatively higher radioactive section some 150 meters thick which is correlated with the Doig phosphate. The succeeding section displays a pattern consistent with the upper Doig Formation.

References

Ferri, F., Golding, M., Mortensen, J.K., Zonneveld, J.-P. and Orchard, M.J. The Toad Formation in northwestern Halfway River map area (94B/14); BC Ministry of Energy, Mines and Petroleum Resources, Geoscience Reports 2010.