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Variability of Subsurface Distribution of the Late Jurassic Roseray Formation, Southwestern Saskatchewan

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Summary

The Roseray Formation is a sandstone-dominated Late Jurassic unit located in subsurface southwestern Saskatchewan and accumulated along the western shelf of the Williston Basin. The formation belongs to the Vanguard Group along with underlying shale-dominated Rush Lake Formation and overlying, shale to calcareous shale, Masefield Formation. The Roseray Formation is dominated by medium to fine grained quartz arenite, kaolinitic sandstone, bioturbated kaolinitic mudrock/shale, bioturbated sandy mudrock and muddy sandstone. The sandy facies are characterized by flaser bedding, lenticular bedding, low angle cross-lamination, and vertical burrows. Horizontal burrows occur within the muddier facies. The quartz arenite lithofacies makes the best reservoirs, occurs mainly in the western portion of the study area and is commonly oil-stained. The sandstone lithofacies are thickest in western region of the study area and gradually become thinner eastward due lithologic transition to the muddier lithofacies. In a northeastward trend from the western edge of the Williston basin, the sandstone lithofacies pinches out and gives way to a shale-dominated lithofacies of the Reirdon Formation. The southeastward trend shows that the sandstone lithofacies of the Roseray Formation interfingers with shale and calcareous shale lithofacies of the Reirdon Formation. The carbonate content of the latter increases farther southeastward toward the international border and closer to the depocenter of the basin. The sand-dominated lithofacies appear to be confined along a roughly north-south trend parallel to the Sweetgrass Arch; a tectonically-induced paleohigh limiting the western border of the Williston Basin. However, oil production is limited within discrete and close-by fields but not along the trend of the sandstone distribution. Preliminary results core and cutting show that sandstones from the non-producing wells are less porous and contain higher matrix content. Further petrographic analysis on these sandstones is in progress.