Depositional trends and facies distributions in the Mississippian Midale Beds; Steelman Field, Southeastern Saskatchewan

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The Steelman Field is located on the northeastern flank of the Williston Basin, where hydrocarbons are being produced from the Midale and Frobisher Beds. Carbonates and evaporites in the Midale Beds were deposited over a shallow, gently dipping epeiric ramp, where minor fluctuations of relative sea level caused significant lateral migration of the coastline and periodic exposure. Four transgressive-regressive sequences (S1, S2, S3 and S4, in ascending order) were identified in the Midale Beds using detailed core descriptions, stratigraphic cross-sections and facies analyses.

Sabkha deposits of the Frobisher Evaporite represent the regressive phase of S1. The S2 and S3 sequences are characterized by barrier bank and back-barrier washover facies that grade landward into restricted lagoon, algal marsh, intertidal and salina-lake facies. These facies are commonly interbedded with one another, indicating complex interfingering of the various environments. Subtle stratigraphic traps may exist within these sequences of the lower Midale Carbonate. The upper contacts of S2 and S3 are subaerial exposure surfaces that are often characterized by small-scale paleokarst features and/or caliche deposits. Transgressive deposits of S4 overstep S2 and S3 and onlap the S1 unconformity surface further landward. During transgression, open-marine skeletal wackestone and packstone initially filled paleotopographic lows. A gradual loss of accommodation space created persistent, shallow-water conditions over much of the ramp. Reduced circulation resulted in the widespread deposition of restricted subtidal facies consisting of bioturbated dolomudstone. S4 is capped by evaporitic mud-flat deposits and extensive playa facies (Midale Evaporite) that gradually prograded over restricted subtidal deposits.