Potential Unconventional Gas Reservoirs of Alberta - What Do They Have in Common? What are the Main Differences?

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Summary

This core display presents two contrasting examples of basin-centre gas reservoirs. Each core illustrates the main characteristics of a unit that has at least locally produced unconventional gas. The two cores were picked to illustrate two completely different facies that produce unconventional gas. These kinds of reservoirs are compared and contrasted to show the critical factors affecting gas trapping.

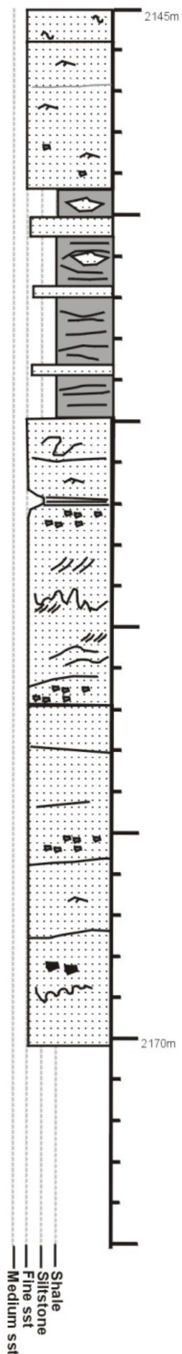
Core 1 – Nikanassin Formation

This core shows the typical non-marine facies that comprises the largest volume of rock in all the Jurassic- Cretaceous clastic wedges in the basin. The sandstone reservoir facies are crossbedded to rippled channel sands with coaly laminations. They can be interpreted as river channel sands but many of the larger Nikanassin sands are likely almost completely non-marine incised valley fills. They have porosities up to about 10% but relatively low permeabilities (commonly 1 to .01md). Gas generated from coals is therefore slow to migrate updip. On an average basis, the sandsones comprise about 30% of the unit. These characteristics are similar to highly productive tight sand reservoirs in the US western Interior in the Mesaverde Group of Colorado and Wyoming.

This unit produces some unconventional gas in the Alberta Basin. The regional trapping mechanism is similar to the Mesaverde where low permeability isolated lenticular sands beds are gas saturated because of downdip gas generation. Commercial-grade trapping however, seems to require a more conventional trap, either structural or stratigraphic.

NIKANASSIN FORMATION

06-19-69-6W6



Sst - fine, interbedded with muddy lenses and laminations, burrows, possible double mud drape

Sst - fine, rippled, coaly and shaley breaks, stylolites, small mud clasts

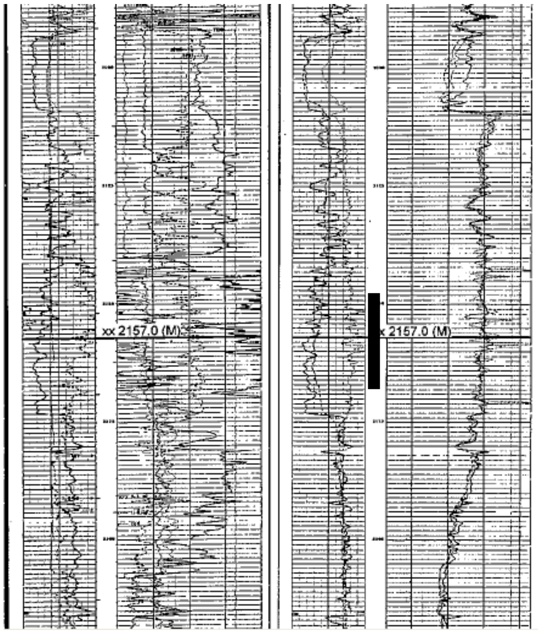
Shale - lenses and laminations of fine sst, some thicker beds (30-50cm) rippled fine sst double mud drapes, rare borrows

Sst - fine, crossbeds, shale beds and coaly partings, ripples, mud clasts, deformed laminations

Sst - fine, crossbeds, thick laminations,soft-sed slumping, stylolites

Coaly splits, many mudclasts at base

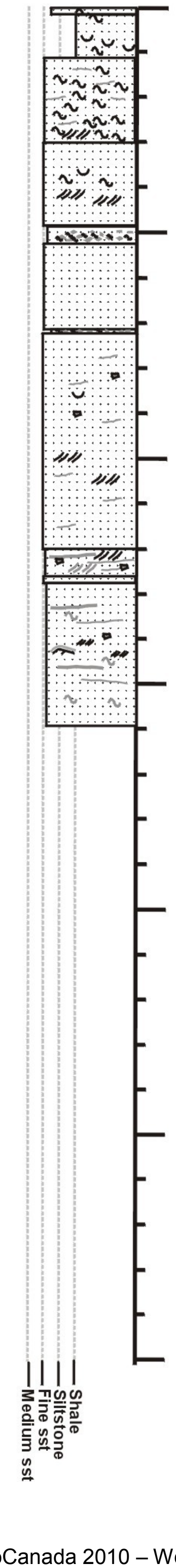
Sst - fine, many coaly splits, shaley splits, mudclast zones, ripples



Core 2 – Rock Creek Formation

The Rock Creek Formation is a laterally-extensive sheet sand that has moderate to low porosity and generally low permeability. It is gas saturated to the west but has more water eastward up the structural dip. It has analogues in the Falher Member and Laramide basins of the US where sheet sands provide a continuous conduit for water to move basinward until interrupted by a trapping configuration that holds gas downdip. In the case of the Falher A, the trap is a basal Nikanassin incised channel that cuts the Falher A shoreface sand and replaces it with fine-grained non-marine sediments. In some of the Laramide basins the trap is structural. Here in the Rock Creek, the trap is an internal stratigraphic trap, a valley fill contained within the unit ahown on the cros-section. The most efficient development of these unconventional resources depends upon developing a clear geologic understanding of the trapping configuration.

POCO WEST PEMBINA
14-14-49-15W5



Sst- fine, bioturbated, calcareous

Shale - highly biuturbated, large clam shells

Sst - fine, highly burrowed, Terebellina, broken-up shale laminations and beds, one clear crossbed set

Sst - fine, cleaner than above, faint lam, bioturbation, crossbed sets, sideritic clasts, carbonate cemented zones, small bivalve shells

Zone ~50% broken-up shale beds, mudclasts, bioturbated, pyrite

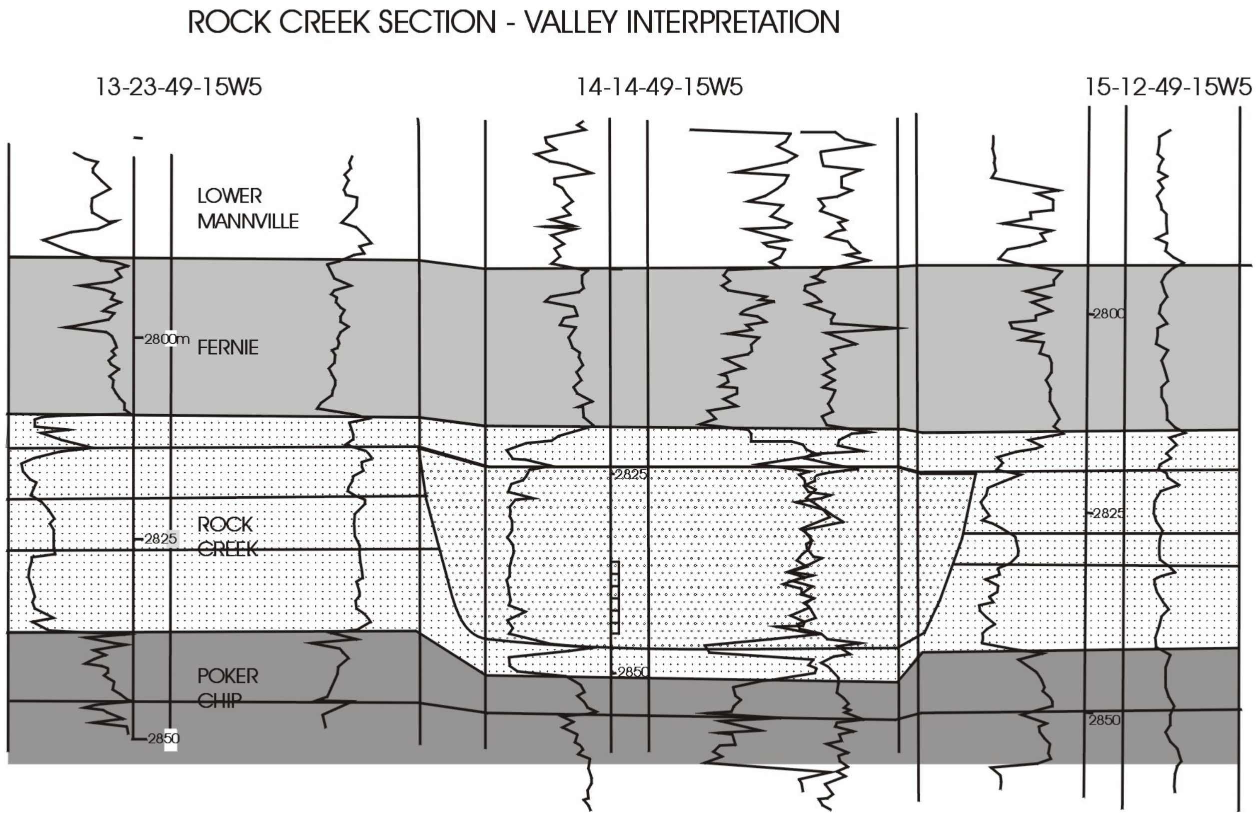
Sst - fine, very uniform, massive, stylolites

8-cm zone of broken-up shale beds, as above

Sst - fine, irregular wispy lam of shale, shells, mudclasts, small, poorly defined crossbeds

Sst - as above, but more mud interbeds, some mud beds on crossbed sets, small mudclasts common, possible ripples, DMD

Sst - fine, shaly lam, crossbeds, mudclasts, mud-draped ripples, burrows



Conclusions

The types of “Basin-Centre” or “Deep-Basin” traps discussed here may be the future of Alberta Basin production for companies of moderate sizes as they do not require the scale of land acquisition or initial investment that “Shale” plays do. In most cases, unconventional plays require a trapping configuration to contain commercially viable gas resources. Many unconventional oil deposits are subject to the same requirements.