

August 2021 – CSUR Virtual Field Trip

A Virtual Field Trip to explore the Cardium Formation!



A VIRTUAL FIELD TRIP TO EXPLORE THE CARDIUM FORMATION!

PRESENTED BY
JON NOAD, SEDIMENTAL SERVICES

As we did last year, CSUR engaged the services, experience and knowledge of Jon Noad (SediMental Services), a senior geologist, to visit one of Alberta's most important plays over the past few decades, namely the Cardium. Given that an in-person trip would once again be challenging to coordinate at this time, a virtual trip was planned, with our tour guide filming and documenting the characteristics of several analogue outcrops. Together with supporting slides, core photos, log data, and other critical details, the attendees were shown footage of field stops at Ram Falls, Yamnuska, Seebe Dam, and Sheep River.

The objective of the trip was to investigate the qualities of the Cardium formation in the Pembina field, which was discovered in the 1950's and is considered the largest oil field in Canada (~4000 km²). In viewing the various outcrops, Jon compared and contrasted the conventional portion of the play with the characteristics of the fringe or "halo" region. With the advent of horizontal drilling and multi-stage hydraulic fracturing, the Cardium formation has once again gained prominence with various operators as technology has enabled favorable economics for wells in the peripheral of the play. The Cardium, which is roughly 90 million years of age, is made up of mostly shoreface sandstone facies. While the higher quality Cardium reservoir has pretty much been depleted (over 1.1 billion barrels of oil produced), the speaker indicated that the "fringe" portion could potentially

contain 25 billion barrels of oil in place, with at least 700 million barrels of recoverable oil using current technology.

Although nothing can replace an in-person field visit and the on-site experience of looking at the outcrops, the presenter expertly highlighted the intricate characteristics of the rocks, including the stratigraphy and geological subtleties, as they relate to the subsurface and the utilization of an unconventional approach for this traditionally conventional play.

SUMMARY

The Cardium Formation is one of Alberta's hydrocarbon related jewels, with an estimated 10.6 billion barrels of oil initially in place, including as much as 9.4 billion barrels in the Pembina Field. The Cardium Formation was deposited in a coastal setting, with most of the reservoir facies made up of shoreface facies ranging from high permeability upper

shoreface sandstone deposits to muddy offshore deposits. The advent of unconventional recovery techniques, such as horizontal drilling and fracking, have opened up low permeability, muddy sandstone reservoirs (the so called "fringe play"), giving the Formation a second lease of life.

A detailed understanding of the reservoir facies distribution is essential to maximize oil recovery. Fortunately, a series of excellent exposures have allowed unprecedented access to these rocks, and several of these will be visited during the Virtual Field Trip (VFT). Highlights will include Ram Falls, Seebe Dam, Horseshoe Dam, Sheep River Falls and Yamnuska Quarry. The facies, ichnology and sequence stratigraphy of these outcrops will be demonstrated through videos shot at the outcrop, as well as slides explaining their applicability in the subsurface. Examples of the facies from core will also be shown. The use of sequence stratigraphy in interpreting the parasequences and sequence stratigraphic surfaces will be demonstrated.

While visiting the field is still the best way to soak up the geology, the use of VFTs allows a high level of focus on the best outcrops, the chance to view multiple outcrops hundreds of kilometres apart in a short time frame, the ability to explain concepts using digital material, and a safe and cost effective experience. The world class outcrops on display should make this a memorable day "in the field".

PRESENTER: Jon Noad, SediMental Services

After graduating from Imperial College, London in 1985, Jon worked as a mining geologist in South Africa. He returned to Europe in 1990 to survey submarine cable routes, and completed a Masters in Sedimentology at night school. This was followed by a full time PhD. based in eastern Borneo, after which he joined Shell, taking on various production and Middle Eastern exploration roles. He moved to Calgary in 2006 and has worked as Senior geologist and Exploration Manager for several Canadian and Colombia based oil companies. He currently runs SediMental Services, offering consulting and geological training, focusing on field trips. In his spare time Jon likes running, wildlife

