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# Pit-wall and core expressions of intra-point-bar erosional surfaces in McMurray Formation point bars, Fort Hills Mine, Alberta, Canada

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## Summary

Intra-point-bar erosional features have been identified inside of the walls of the Fort Hills oilsand mine and have been documented with photographs and video. It is presumed that the unique geometries observed in between the steeply dipping beds inside of the intra-point-bar erosional deposits and the younger IHS (Inclined Hetrolithic Stratification) beds would be relevant to any effort made to drain the bitumen during an insitu thermal recovery process like SAGD (Steam Assisted Gravity Drainage). A comparison of the pit wall expression of these facies to the core expression of these facies should help to identify these sedimentary patterns in other McMurray reservoirs before production begins.

## Theory / Method / Workflow

Located in northern Alberta Canada, the Fort Hills open pit mine site excavates bitumen from the lower Cretaceous McMurray Formation. The largest deposits of the McMurray Formation are interpreted as being from tidally influenced channels that deposited 30-meter-tall point bars composed of poorly lithified sandstones and mudstones. In isolated locations inside of the mine, detailed photographic evidence from the walls have led to an interpretation of intra-point-bar erosion and cavity fill. During intra-point-bar erosion, the lateral accreting channel erodes backwards on its own point bar creating a cavity. Then when the erosional cavity is filled, a unique bedding geometry is created between the regular IHS layers and the IHS contained inside of the cavity fill.

## Results, Observations, Conclusions

In the pit walls of the mine, intra-point-bar erosional events can be distinguished from normal IHS facies by observing acute angles relative to the previous IHS bedding which maintains a parallel structure. These cross-cutting mudstones are potentially a geotechnical safety risk to the mine and if a mudstone-on-mudstone contact is created they may also create permeability bottlenecks for fluid flow during any insitu hydrocarbon drainage method, such as SAGD.

A review of the core and wireline logs from a well that is believed to have intersected one of these intra-point-bar erosional cavity fills shows a sequence and characteristics that might be helpful for interpreting these events in other McMurray or tidally-influenced point-bar reservoirs: (1) frequent breccia deposits, (2) overlaid by cycles of unusually large meter scale sand and mudstone bedding, (3) a lack of bioturbation in the mudstone beds, (4) uncharacteristic low or high angle dips on the dipmeter log, depending on where the well intersected the erosional cavity.

## Novel/Additive Information

The presentation is an oral version of a publication that came out in the CEGA Bulletin in 2024 with the same name. For a longer and more technical explanation please refer to the publication.

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## References

Bzdziuch, D., 2023. Forecasting the shape and length of IHS mudstone beds in the middle McMurray Formation, Fort Hills mine, AB, Canada. Bulletin of Canadian Energy Geoscience, v. 70, p. 1-19.

Bzdziuch, D. and Hagstrom, C., 2024. Pit wall and core expressions of intra-point bar erosional surfaces in McMurray Formation point bars, Fort Hills Mine, Alberta, Canada. *Bulletin of Canadian Energy Geoscience*, v. *71*, pp.119-142.

Daniel, J.F., 1971, Channel movement of meandering Indiana streams: U.S. Geological Survey Prof. v. 732, 18 p.
Hagstrom, C.A. 2019. Stratigraphic Architecture and Lithofacies Distribution in Meander-Belt Deposits, South Saskatchewan River and Cretaceous McMurray Formation, Alberta. PhD thesis, University of Calgary.

Durkin, P.R., Hubbard, S.M., Loyd, R.L., Shultz, A.W. and Blum, M.D. 2017. Three-dimensional reconstruction of meander-belt evolution, Cretaceous McMurray Formation, Alberta foreland basin, Canada. Journal of Sedimentary Research, v. 87, p. 1075–1099. doi: 10.2110/jsr.2017.59.

Hassanpour, R.M., 2009. A review of McMurray Formation geology in Athabasca oil sands. Annual report, v. 11.

Hubbard, S.M., Smith, D.G., Leckie, D.A., and Fustic, M. 2010. Predicting heterogeneity in meandering river deposits: The point bar to counter point bar transition. AAPG Annual Convention and Exhibition Abstracts New Orleans, v. 19, p. 116.

Johnson, S.M. 2012. The nature of inclined heterolithic stratification in a mixed tidal-fluvial setting: depositional processes, sedimentology and ichnology, Middle Arm, Fraser River, Canada. Master's Thesis. Simon Fraser University.