Stratigraphy and Architecture of the late Silurian Bass Islands Formation, Southwestern Ontario

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Introduction and Approach

The Bass Islands Fm consists of grey-buff, variably laminated, argillaceous dolostones, with minor shales and evaporites (Armstrong and Carter 2010). Paleokarstic features are present and fossils are rare. The karstic features contribute to its high porosity as major groundwater flow zone in SW Ontario. Basal microbialites and shaly dolomites of the Bass Islands Formation overlie the Salina G grey shale with anhydrite nodules. The Bass Islands Formation is overlain by either Devonian Bois Blanc cherty carbonates or Oriskany siliciclastic sandstones. The contact represents an irregular unconformity surface that delineates the Silurian-Devonian hiatus of a few million years (Johnson et al. 1992).

The objective of this study is to describe the depositional environments, and paleokarstic features related to bedrock aquifer systems and to establish a 3D subsurface architecture of Bass Islands Fm based upon outcrops and regional cores.

The approach comprises the logging and sampling of 39 continuous cores across southwestern Ontario integrated with downhole geophysics data. Lithofacies characterization has been carried out within a sequence stratigraphic framework across the cratonic forebulge region and depositional breaks related to bedrock aquifers.

Introduction and Approach

The Bass Islands Fm is dominated by sabkha facies - comprising microbiolites, argillaceous dolostone, anhydrite nodules and subaerial sedimentary structures. Shallowing upward cycles (3-5m thick) comprise subtidal massive dolostones through intertidal to supratidal microbialites possessing evaporite laths and anhydrite nodules. A. Salina G shaly dolostone with common collapse structures - bedding is distorted due to sulfate dissolution. B. Argillaceous dolostone. Note the dolostone nodule in the middle. C. Anhydrite nodules encrusted by crinkly laminated algal laminates. D. Microbiolites with blue fenestrae mottles at base of Bass Islands Fm. E. Breciated dolostone. F. Caliche deposits representing subaerial exposure. G. Recrystallized dolostone, matrix is partially recrystallized. H. Karstic conduit infilled by Devonian siliciclastic sands - 1.4m beneath the S-D contact. I. Devonian siliciclastic sandstone clasts - sinkhole infills.

Summary and Future Work

1.Bass Island is interpreted as being deposited in a coastal environment.

2.Two paleokarstic intervals can be recognized: the lower one was mainly controlled by the dissolution of evaporites and the upper one was formed by epikarst processes, and erosional events during S-D hiatus – spanning a few million years.

3.The varied thickness of the Bass Islands Fm. regionally may have been influenced by the dissolution of both Salina and Bass Islands evaporites.

4.Future work includes the regional correlation using stable isotope.

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Reference