

Sedimentation in the inner Cornwallis Estuary, Minas Basin, Nova Scotia: implications for contaminant accumulation

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The estuary of the Cornwallis River is a macrotidal system within the Minas Basin, like the better-known Cobequid Bay -

Salmon River estuary. Compared to the latter, it is mud-dominated. Tidal range and flow conditions are highly variable:

Site:	Port Williams	New Minas	Kentville
Spring tide range (m):	12.15	4.1	2.15
Max. velocity (cm/s):	177	132	83
Min. velocity (cm/s):	58	29	21

Except at slack water, when suspended sediment settles out rapidly the water column is well-mixed. Suspended sediment concentration varies from 50 mg/l near Wolfville to >4.5 g/l at the turbidity maximum between New Minas and Kentville. Hydraulic sediment sorting is very efficient in this system, with deposits becoming much finer grained up-river. With decreasing velocity, grain size, depth, and bedforms also vary systematically upstream and throughout the neap-spring tide cycle. At New Minas and above, water-saturated clays predominate and bars are smooth, with localized rip-up grooves. On bars at Port Williams and below, silt and fine sand form continuous crested and small linguoid ripples, while fine to coarse sands and gravelly sands form large 3-D ripples. Between Port Williams and New Minas,

plane or rippled, silty beds are interbedded with water-saturated clays deposited at slack water. Overpressure conditions resulting from the ebb of overlying waters produce numerous fluidization features.

Except where the river has cut into Triassic sandstone, the banks are dyked and locally faced with rip-rap. Along most of their length they are mud, deposited from suspension, and intensively gullied. Bank mud deposits are continuously recycled to the river by fluidized flow, scouring, or undercutting and slumping. Seeps and springs are common along the banks at low water.

The Cornwallis estuary has been closed to fishing and recreational use for several years because of persistent pollution. Dissolved contaminants may be carried into the system through tidal pumping of groundwater, as well as surface runoff. It is likely that such contaminants are preferentially absorbed onto clays or organic particles (hydraulically equivalent to fine-grained inorganics). Since these are not flushed out of the estuary, but concentrated upstream, it is likely that contaminant levels are building up in the system.