Ground penetrating radar transect of the Gilbert-type, glaciomarine Pocologan delta, southwestern New Brunswick

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The Pocologan delta is one of several glaciomarine delta complexes in southwestern New Brunswick that formed where large meltwater drainage systems discharged into the Bay of Fundy during Late Wisconsinan deglaciation (~14–12 ka BP). Post-glacial rebound has exposed the delta and its extensive sand and gravel aggregate resources. In August, 2007, ground penetrating radar (GPR) and seismic refraction surveys were acquired over the delta to investigate its thickness and stratigraphy. The study was motivated by interest in exploring how geophysical methods could be used to help assess the extent and quality of New Brunswick's granular aggregate resources.

GPR profiles following the general paleo-drainage direction were acquired along the entire length of an unimproved road that extends 5 km south from Route 780, from a point 100 m east of the Pocologan River. Orthogonal profiles were collected in adjoining blueberry fields, and seismic refraction surveys subsequently targeted features observed in the GPR data. Instrumentation included a GSSI SIR System III GPR unit employing 100 and 200 MHz shielded monostatic antennas, and a 36-channel Geometrics Geode seismic system with a sledgehammer source. In June, 2008, we returned to the site with a Mala GPR system employing a pair of 50 MHz unshielded, rough terrain (RTA) antennas arranged in an in-line configuration.

Previous geological investigations had suggested that the Pocologan deposit could be interpreted as a Gilbert-type delta with: (1) topsets comprising horizontally stratified outwash gravel, cobbles, and sand deposited by meltwater streams flowing on the delta surface; (2) foresets consisting of dipping beds of sand and fine gravel that were deposited in the subaqueous environment at the distal margin of the delta; and (3) bottomsets consisting of silt and clay. The GPR profile confirm this general model, revealing well defined topset, foreset, and bottomset stratification with foreset beds exhibiting apparent dips of up to 18 degrees. Fluvial scour and channel-fill deposition, as well as enigmatic zones of chaotic, discontinuous reflections and diffractions are also observed. The water table was evident as a strong GPR reflection and distinct seismic refraction, varying in depth from 3.5 to 13 m in August, 2007. GPR surveys penetrated up to 25 m in the northern third of the study area but were unable to image the bedrock surface – possibly due to signal attenuation in electrically conductive bottomset beds or underlying glacial till. Seismic refraction surveys indicate that overburden is underlain by bedrock having a high P-wave velocity (~5000 m/s) and significant topography, at depths ranging from 25 to 50 m.

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