



Quaternary geology offshore Avalon Peninsula
Newfoundland and Labrador
Seal Cove to Motion Bay

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Scale 1: 80 000



Assisting compiler: Helen Neilson*, Bathymetric Digital Elevation Model

Derived from limited geophysical traverse data with broad extrapolations based on topographic character

Sparse spot bathymetry points and incomplete datum adjustments result in topographic artefacts in the bathymetric digital elevation model, especially in the areas farther offshore. This includes apparent orientations of features which are incorrect.



Map Explanation

A marine geophysical and sampling survey conducted in 2009 together with a topographic shaded-relief image constructed from Canadian Hydrographic Service (CHS) spot water depth points, provides control for the type and distribution of Quaternary sediments. This map complements a more detailed presentation across the survey area (Bear Cove Head to South Brigus, Sheet 1) and is based on extrapolation of these findings and relation to topography.

Topography is governed by Precambrian metasediments with a strong N-S structural trend, manifest as ridges and valleys, locally cropping-out from a thin till mantle, across a 2-9 km wide zone offshore the headlands. East of this, low relief Cambrian(?) and Ordovician age, slightly metamorphosed shales and siltstones are overlain by a till blanket of several metres or more thickness. This has scattered drumlins and small transverse moraines, locally iceberg scoured. Mini-basins between hills and ridges commonly contain glaciomarine mud pockets with a sand or gravel lag. Isolated ice-carved or bedrock structure-bounded basins and some outer harbours contain various facies of ponded glaciomarine muds, generally with a sand lag cover. Thick sea-level low-stand terraces likely record the reworking of glaciogenic material from the paleo-coastline and land-based glaciers. Inside the headlands are local deposits of post-glacial mud.

Accompanying map sheets depict the stratigraphic succession (Sheet 3) and sediment thickness (Sheet 4). A separate poster (King 2013, Open File 7360) presents examples and interpretations of the geophysics, photography and sediment core sample data and provides a glacial chronology and potential engineering constraints and opportunities.

QUATERNARY

LEGEND

POSTGLACIAL SEDIMENTS

Post glacial sediments include the reworked component of glacial deposits derived mainly from wave and current action during the postglacial marine transgression. Locally still active where such processes still persist such as shallow water and along hills and escarpments. It comprises mainly sand and gravel lag deposits overlying all the older map units. These are unmapped here because they are generally under 0.5 m thick, highly variable spatially, and only properly registered on the sidescan sonograms which cover only a small portion of the map area.

LATE GLACIAL TO POSTGLACIAL

Terraced depocentres partly filling Bay Bulls, Cape Broyle Harbour, Calvert Bay and outermost Aqueforte harbours to and beyond the mouths. Little internal seismic character resolved. These remain undated so it is not clear if they are earliest Holocene or latest Late Wisconsinan age.

Low-stand complex: Incoherent, homogeneous or possibly prograding internal seismic character. Occurs as terraced deposit in select harbours and harbour mouths with slightly inclined top at 30 to 40m water depth (seaward dipping) and a steep, well-defined seaward slipface/foreset (up to 10°) reaching to over 80 m water depth. Possibly with foreset beds but also as weakly stratified basin fill. Topped with sand and gravel. Locally worked into bedforms. Deposit volume and setting suggests accommodation space was governed by low-stand (wave-base influence) during significant sediment input, either from land-based glacier remnants or coastal erosion of glaciogenic materials following marine exposure and transgression. Unsampled.

GLACIAL SEDIMENTS

Till and pro-glacial marine sediments deposited with retreat of the glacier to land. Till has a strong acoustic scattering affect generally registered as an acoustically incoherent signature on ultra-high and high resolution seismic profiles. This, surficial texture and deposit morphology, including drumlins and moraines, is the basis for identification of the till. Late-phase glacial processes appear to have continued to deposit in the marine realm when the ice margin was near the present coast or just beyond the headlands. Three pro-glacial stratigraphic units are recognized; a poorly stratified deposit interpreted to be either an iceberg turbate and/or transitional between a till and a water-lain glaciomarine mud (Gm), an overlying partly-stratified deposit (Gms) and over this but restricted to an isolated basin, a well stratified deposit (Gws). The two latter are only recognized where there is seismic control; unmapped small glaciomarine mud basins are likely. Late Pleistocene age from the Late Wisconsinan glaciation.

Gws **Glaciomarine Well Stratified Mud:** Well stratified seismic character. Overlies earlier but less well stratified glaciomarine muds. Mapped only in basin outside Cape Broyle Harbour but mud samples in isolated headland-situated basins may be equivalents. Late stage localized plume deposit from marine-based ice emanating from Cape Broyle Harbour.

GD **Debrite:** Acoustically homogeneous lense/wedge conformably overlying unit Gms. Debris flow scar is not recognized but the parent material is likely glaciogenic originating from the steepest (northwest) bedrock topography-governed basin flank. The debris flow event occurred previous to glacier retreat to land (covered by unit Gws) so it occurred immediately following ice retreat from the basin (14.8 ka, King 2013). Run-out was sufficient to drape a mid-basin hill.

Gms **Glaciomarine Stratified Mud:** Acoustically well to weakly-stratified. Similar to unit Gm but with stratification. More coherent beds arise either because they have been subject to lesser iceberg turbation as the iceberg draft population diminished or a more proximal point source.

Gm **Glaciomarine Mud:** Acoustically poorly to non-stratified, draped in small bedrock and till-floored basins and valleys and in troughs between moraines. Locally undifferentiated from Gms which generally overlies Gm but occasionally they are interspersed. A silt-rich mud with significant sand and gravel component. An unconformable upper surface is common and generally has a thin (cm to dm) sand lag and less commonly a gravel lag not mapped. Deposited by proglacial meltwater plumes in quiescent and open marine conditions.

GTn **Thin Till and Isolated Bedrock hummocks:** Till, as below but as a thin and patchy sheet overlying bedrock; Isolated bedrock outcrops common. Scoured and pitted by both relict and modern icebergs.

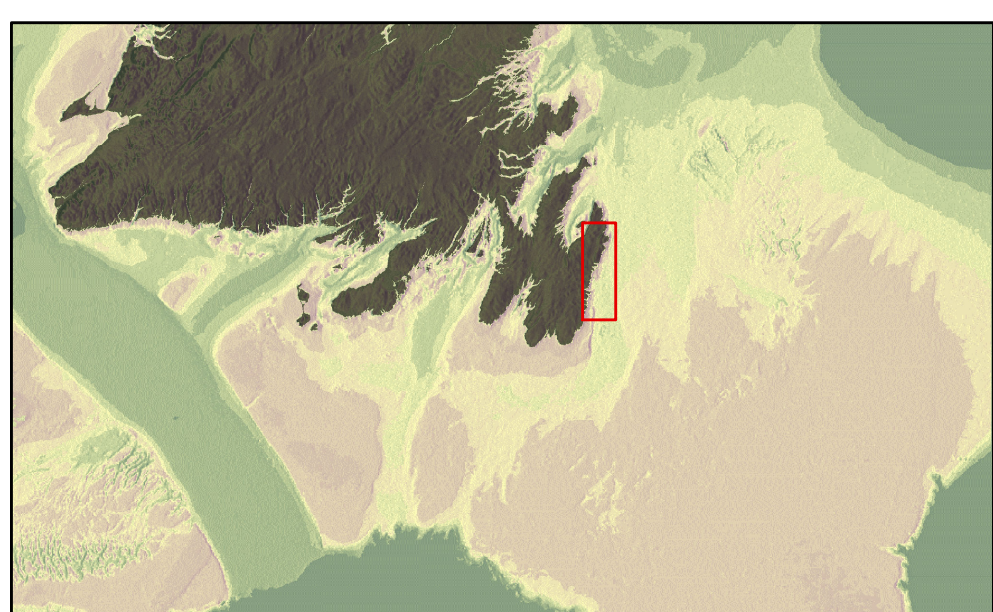
GTk **Thick Till:** Diamict, generally with a surficial boulder cobble or sand and gravel lag; Largely in the form of blanket deposits up to 10's of metres thick; Locally with narrow sub-parallel transverse ice retreat moraines and drumlins in the offshore. Poor registration of thin deposits on the seismic profiles precludes precise delineation of its distribution versus the thin till (GTn).

Geologic Contact:
— Defined
--- Inferred

Geophysical Survey Track
— G.I. Sleevegun (10°), Huntec Deep Towed sparker, Klein Sidescan 3.5 kHz from 1990 survey

Drumlin: Till-cored, streamlined hill heavily armoured with gravel and cobble.
→ Orientation unmeasured

Drumlin Field: Approximate limit of drumlin field as inferred from roughness in digital elevation model



The authors acknowledge Canadian Hydrographic Service (CHS), Fisheries and Oceans Canada, for the offshore bathymetry data points, the Canada Atlas (atlas.nrcan.gc.ca) for the image of land topography and the Program of Energy Research and Development (PERD) and the Geoscience for Offshore Development Program (GCOD) for field and processing support.

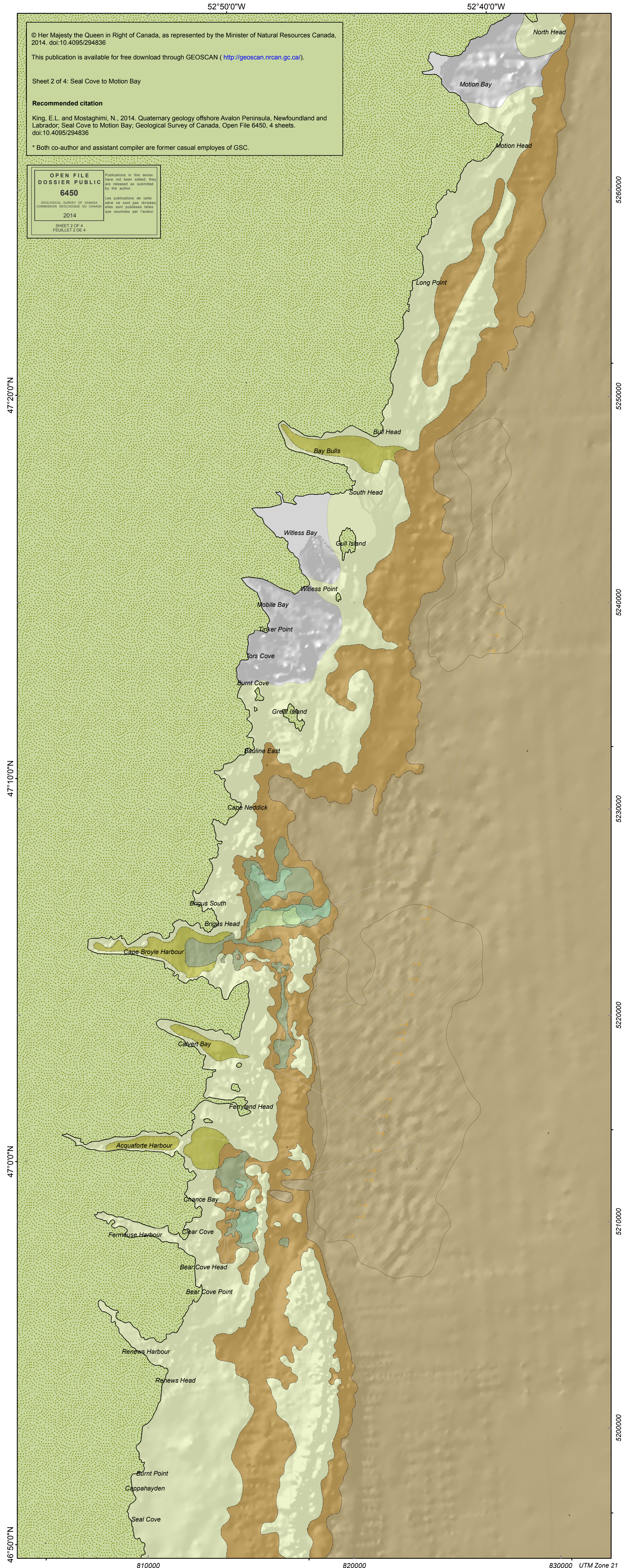
Reference

King, E.L., 2013. Geological conditions off the Avalon Peninsula, offshore easternmost Newfoundland: bedrock and glacial features, deglaciation pattern and chronology, mass failure and attributes and constraints to engineering. Geological Survey of Canada, Open File 7360 (revised) Poster. doi:10.4095/292593.

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Sheet 2 of 4: Seal Cove to Motion Bay
Recommended citation
King, E.L. and Mostaghimi, N., 2014. Quaternary geology offshore Avalon Peninsula, Newfoundland and Labrador: Seal Cove to Motion Bay, Geological Survey of Canada, Open File 6450, 4 sheets. doi:10.4095/294836
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OPEN FILE DOSSIER PUBLIC 6450
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
2014
SHEET 2 OF 4
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