DESCRIPTIVE NOTES

Quaternary Deposits and Events

The oldest unconsolidated unit in the map area is residuum. It represents mechanically and chemically weathered bedrock. Economy Mountain is veneered largely by basalt residuum, which is chemically altered to a saprolite (Rutherford and Bustos, 1987) and overlain by Holocene soil. Granite bodies near East Mapleton exhibit mechanical weathering and are being quarried for aggregate. The age of this deposit is not known but the intense chemical weathering suggests a pre-Wisconsinan and perhaps a pre-Quaternary age.

Pre or Early Wisconsinan deposits were found in a deep borehole near Noel Lake (Section 6, Figure 1). Fifteen metres of peat, with shells and wood fragments, underlie two till sheets. Palynology of the peat beds revealed a monotonous assemblage dominated by pine, spruce and birch suggesting cool boreal forest conditions. The wood from this site was not dated but it is correlative with the Miller Creek organic site (Stea and Hemsworth, 1979) dated at > 52,000 years B.P. (GSC-2694). The deposit may represent an Early Wisconsinan interstadial or part of the Sangamonian interglaciation (75,000–125,000 B.P.).

The first Wisconsinan glacial event after the deposition of the Noel organics was an eastward to southeastward ice flow stemming from a centre outside the province. Figure 2a shows the flow lines of this glacier based on the trend of striations, drumlins and till fabric in the map area. Most of the striation sites where this flow was recorded are plotted on the figure. The McCarron Brook–East Milford Till (MB; Sections 1–3 and 5–10, Figure 1) was deposited during this ice flow event (Stea, 1984; Stea et al., 1985). This till is named after type localities east and south of the map area (Williams et al., 1965; Stea et al., 1985). It is a compact lodgement till until fissured at the base of many sections along the coast and out crops as small unmapped windows along the sides of east–trending valleys in the Cobequid Highlands. Erratic content of the McCarron Brook–East Milford Till in the map area varies with location. Along the Northumberland Strait shore the till has less than 1% igneous erratic content. South of the Minas Basin it can contain up to 40 % igneous rock content derived from southeastward ice flow across the Cobequid Highlands.

The next phase of ice flow across the map area was southwestward in the western part, swinging to southward in the eastern part (Figure 2b). This flow was funnelled down major cross-axial valley systems such as the Folly Gap in the Cobequid Highlands. Striations formed during this flow parallel surface fluting and drumlins. Material from the redbeds of the Pictou Group was entrained by the glacier and subsequently transported and deposited over vast areas to the south on the Cobequid Highlands and on mainland Nova Scotia. The distinctive reddish till produced is called the Eatonville–Hants Till (E) after type localities (Williams et al., 1965; Stea et al., 1985). This till represents the surface till sheet over most of the map area. The stony facies (Es) is a melt-out till derived from basal and englacial debris. This accounts for the associated hummocky ice stagnation topography and glaciofluvial deposits. Some of the isolated hummocks on the map may represent moulin kames. The composition of the Eatonville–Hants Till is highly variable because it has been modified by subsequent ice flows. Till fabric in some sections indicates northward ice flow (Sections 1, 5 and 10; Figure 1). Cobequid Highland–derived erratics are found in the Eatonville–Hants Till north of the highlands and east of Springhill. Figure 3 is a schematic illustration showing the formation of the Eatonville Till and subsequent stony tills by southward and then northward ice flow.

Striation evidence for a northward ice flow (Phase 3, Figure 2c) is found throughout the map area and had been previously mapped by Chalmers (1895). Type localities for striations relating to the northward ice flow are at Tennycape and Economy Lake. The flow stemmed from an ice divide on southern Nova Scotia. This glacier flowed northeastward across the Minas Basin, northward across the Cobequid Highlands and Cumberland–Pictou Lowlands, and northeastward in the Northumberland Strait. Stony, locally derived tills (Cobequid and Moose River Tills) were probably formed by this glacier. Erratic boulders from the Cobequid Highlands were transported northward onto the Cumberland–Pictou Lowlands on the surface of the Eatonville–Hants Till (Figure 4).

The last phase of ice flow involved the readvance of glaciers centered east and northeast of the map area (Phase 4, Figure 2d). These glaciers flowed westward in the Minas basin area and southwestward in the Amherst area. The relative timing of these ice flows has not been established. At Tennycape, striations formed by the northward flow (Phase 3) are cut by striations trending westward. The Shulie Lake Till was probably formed during this phase.

Ages of these ice flows are speculative because none of the tills related to the flows have been dated directly. The McCarron Brook–East Milford Till is believed to be Early Wisconsinan because it overlies Sangamon peat beds. The subsequent three ice flow phases are believed to span Middle to Late Wisconsinan time (64,000 years B.P. – 10,000 years B.P.).

Deglaciation

Deglaciation is first recorded by the deltaic glaciofluvial and glaciomarine sediments of the Five Islands Formation Figure 2e. Shell dates on bottomset beds of a delta at Spencers Island west of the map area range from 14,300–12,600 years B.P. (Stea and Wightman, 1987). Ice free conditions in the Cobequid Highlands were present by at least 10,764 years B.P. (P-951, Livingstone and Estes, 1967) as suggested by a basal date from a bog near Folly Lake. Ice may have persisted longer in areas south of the Minas Basin affected by phase 4 glaciers. A minimum date on Shaws Bog in Hants County is 9,100 years B.P. (I–7060, Hadden, 1975).

These dates serve as the main constraints for the speculative ice retreat patterns shown in Figure 2e. The margins outlined are based on the position of moraines, meltwater channels, zones of ablation till and the contact of outwash fans and ice contact drift. Marine incursion into the Minas Basin may have cut off northward flowing ice from its source (Phase 3, Figure 2c) or hastened the retreat of the westward–flowing Phase 4 glacier (Figure 2d). Sometime after this event northward– and southwestward–flowing ice masses separated in the Springhill area. Outwash valley trains in the Collingwood Corner–Lily areas relate to a southward–retreating ice mass. In the Amherst area ice retreated northeastward.

Glacier retreat was interrupted during a period of climatic warming from 11,800–10,500 years B.P. In several areas of Nova Scotia peat beds dating in this interval are buried by a till–like diamicton (Mott et al., 1986). If this diamicton is a till the glacier advances, perhaps those during Phase 4, may have affected Nova Scotia in the interval from 10,500–10,000 years B.P.

Economic Geology

Aggregate Resources

Outwash deposits of the Saints Rest Member provide the best aggregate resources in the map area. These deposits are generally well sorted, have few fines but abundant gravel and sand, and consist of well rounded, durable stones. The deposits at Bass River and Portapique have high quality aggregate with a relatively high petrographic number. Soft sedimentary lithologies are more abundant in the deposit at Lower Five Islands. The grain size and durability of clasts in the outwash deposits on the north side of the Cobequid Highlands increase toward the Highlands. These outwash deposits can be utilized for gravel base, concrete and asphalt.

Ice contact stratified drift of the Apple River Member is much more unpredictable in grain size and soundness. The deposits vary from road base grade to asphalt grade.

Alluvial or stream deposits can provide a good source of aggregate locally, but limitations include the common use of the areas as prime farmland and the proximity to the watertable.

Residuum deposits have been used in some areas as sources of aggregate, primarily for road base. The highly weathered nature of the clasts renders them useless for concrete or asphalt.

Clay Deposits

Clay deposits have been found along the north side of the Cobequid Highlands. A mapped deposit occurs north of Wentworth Station. Buried deposits may occur underneath outwash deposits of the Saints Rest Member on the north shore of the Minas Basin. The quality of these clay deposits has not been determined.

Peat Deposits

The large peatland northeast of Amherst known as the Missamaguash Marsh does not have significant peat moss production potential (Anderson and Broughm, 1986). This deposit averages only 2m in thickness, is very susceptible to flooding and is a wildlife management area. Thicker deposits of moss grade peat are found in peatlands adjacent to Highway 66 (Anderson and Broughm, 1986). A bog 5 km southeast of Athol Station has a thick layer of moss grade peat averaging 3m. No fuel grade peatlands were found in the map area.

Diatomaceous Earth

Deposits of diatomaceous earth have been found at Economy Lake, Gamble Lake, Sutherland Lake and Webb Lake (S. Anderson, personal communication, 1987)

Drift Thicknesses

Spot thicknesses on the map are based on well log data from the Nova Scotia Department of the Environment. In the legend a range of thicknesses are estimated for each of the surficial units. A relationship exists between drift thickness and topographic elevation. An estimate of drift thickness in till–covered areas can be made by applying the formula:

$$T = 40 - .038(E)$$

T = Average thickness of till cover (feet)
E = Topographic elevation (feet)

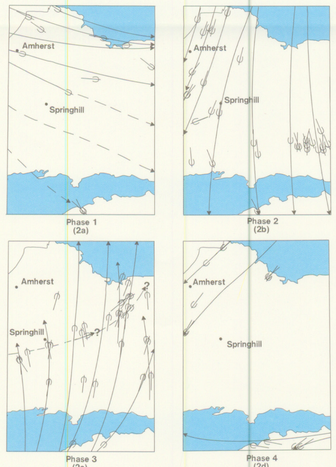


Figure 2. Ice flow reconstructions and deglaciation for the Sheet 10 area. Shown on Figure 2e are the inferred ice retreat paths and locations of some major outwash bodies.

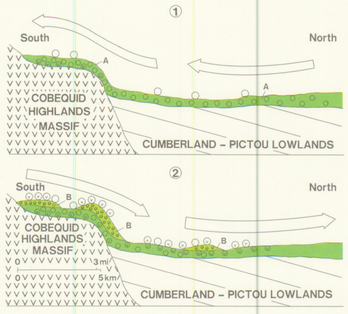
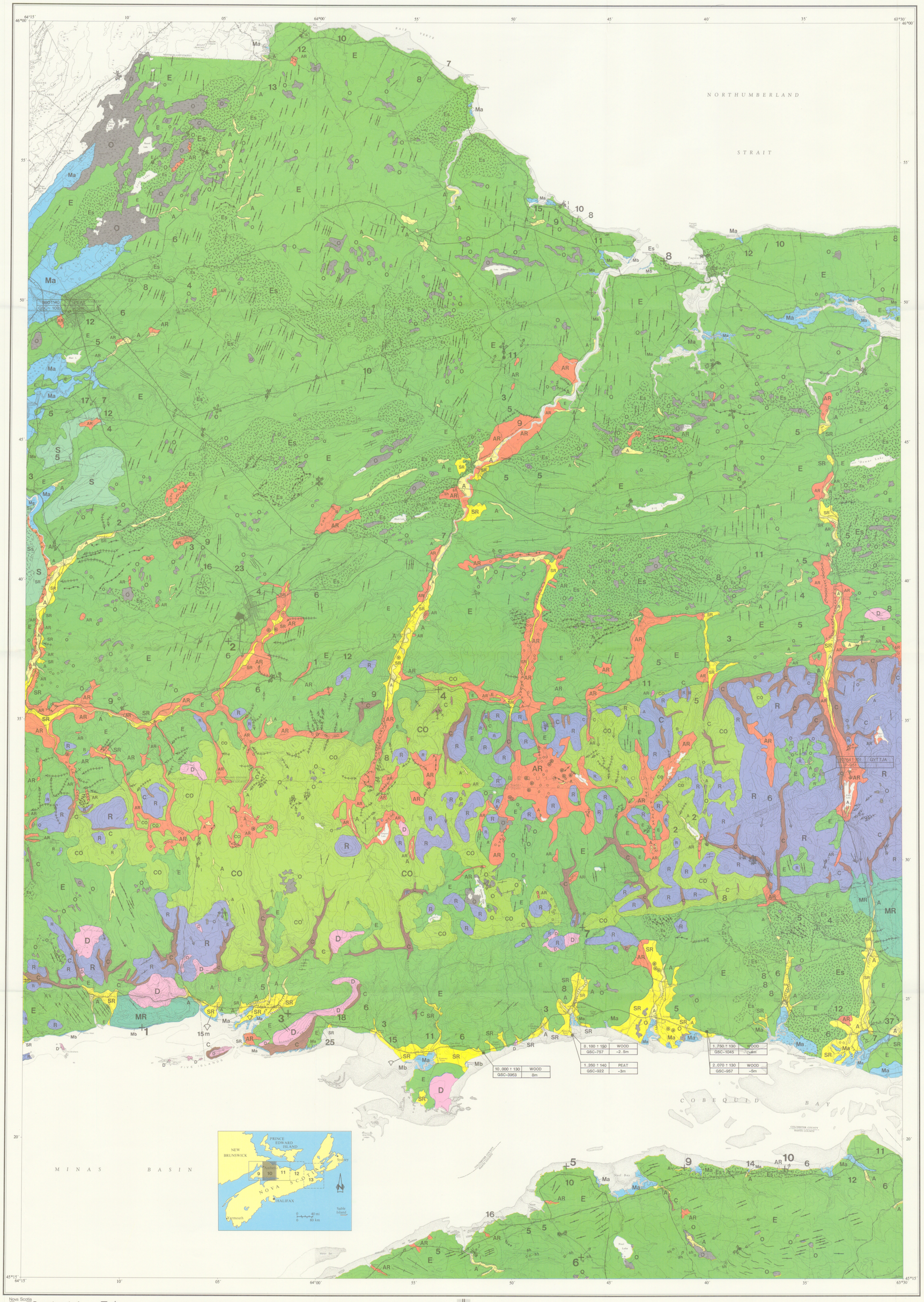


Figure 3. Diagrammatic representation of the major till–forming ice flow phases in the study area.
1. Southward ice flow (Phase 2) forming the Eatonville Till (A)
2. Northward ice flow (Phase 3) forming the Stony Till (B) on the highlands and transporting Cobequid Highland erratics over and in the previously deposited Eatonville Till.



Nova Scotia Department of Mines and Energy
Energy, Mines and Resources Canada / Energie, Mines et Ressources Canada
Geological Survey of Canada / Commission géologique du Canada
Canada — Nova Scotia Mineral Development Agreement

LEGEND

SURFICIAL DEPOSITS
QUATERNARY

HOLOCENE

NONGLACIAL ENVIRONMENT

O — ORGANIC DEPOSITS: O, peat, gyttja, clay; underlies bogs, fens and marshes, generally greater than 1m thick.

C — COLLUVIAL DEPOSITS: C, gravel, sand, silt, minor clay and organic material; a complex mixture of glacial deposits, weathered and frost shattered rock, formed by periods of downslope creep and/or mass movement along steep valley walls, 1–10m thick.

A — ALLUVIAL DEPOSITS: A, gravel, sand, silt, minor clay and organic material; forms flood plains, channel and bank deposits, 2–15m thick.

Ma | Mb — MARINE DEPOSITS: Ma, fine sand, silt, clay; locally overlain by peat and organics (salt marsh); forms intertidal mud flats; Mb, gravel, sand; forms beaches, bars and spits, 2–15m thick.

NONGLACIAL AND GLACIAL ENVIRONMENT

LATE WISCONSINAN

FIVE ISLANDS FORMATION: glaciofluvial, glaciolacustrine and glaciomarine deposits laid down during the retreat of glaciers and rise and fall of sea level.

SR — SAINTS REST MEMBER: SR, glaciofluvial gravel, sand and minor silt; massive to horizontally stratified, channel sequences common; forms outwash plains and topset parts of Gilbert–type deltas, 3–30m thick.

AR — APPLE RIVER MEMBER: AR, ice contact stratified drift, boulders, gravelly sand, sand and silt; abrupt changes in grain size between beds; faulting common; till may be included locally; forms hummocky and kettled terrain, terraces along valley sides, 4–30m thick.

GLACIAL ENVIRONMENT

Ss | S — SHULIE LAKE TILL: S, olive–brown, stony, sand till; moderately compact, inclusions of reddish–brown till locally, subangular and angular clasts; clast lithology: greater than 90% sandstone clasts (Cumberland Group); forms ribbed and ground moraine topography, 1–10m thick; Ss, (stony facies) olive–brown stony till; loose, coarsely fissile, subangular and angular clasts, horizontal sand inclusions and beds; forms knob and kettle topography, 3–15m thick.

CO — COBEQUID TILL: CO, greyish–brown very stony sand till; loose to compact, bouldery near surface, angular clasts; clast lithology: 90% local bedrock lithologies, crystalline, volcanic and metamorphic rocks; forms a thin veneer of ground moraine over parts of the Cobequid Highlands, 1–5m thick.

MR — MOOSE RIVER TILL: MR, grey silty sand till; compact, sandy partings locally; clast lithology: 60% grey metamorphic and sedimentary rocks; forms hummocky, ribbed and rolling ground moraine, 2–10m thick.

Es | E — EATONVILLE–HANTS TILL: E, reddish–brown silty sand till; moderately compact to compact, fissile and massive, jointed, MnO_2 staining along fissility planes; clast lithology: generally >50% Carboniferous sedimentary rocks with increasing percentages of igneous and metamorphic lithologies east of Springhill and southward onto the Cobequid Highlands; surface boulder layer in these regions is usually enriched in Highland lithologies; forms fluted, drumlinized and rolling ground moraine, 1–15m thick; Es, (stony, sandy facies) reddish–brown stony sand till; loose to moderately compact, coarsely fissile, gravelly–sand and sand inclusions, partings and beds; clast lithology: contains higher erratic (Cobequid Highland) content than regular facies; forms hummocky and ribbed moraine generally in topographic depressions, locally with ice contact stratified drift, 3–20m thick.

EARLY WISCONSINAN (?)

MB — MCCARRON BROOK–EAST MILFORD TILL: MB, greyish–red silt till; very compact, massive; clast lithology: dominantly local lithologies with up to 6% erratics; with striated boulder horizons indicating southeastward and eastward ice flow; may out-crop in unmapped "windows" through younger drift along east–trending valleys; seen in section only.

ROCK
PRE–QUATERNARY

D — RESIDUUM: D, fragmented, mechanically and chemically weathered bedrock, overlain by a discontinuous, thin veneer of till, 1–6m thick.

R — BEDROCK: R, glacially scoured bedrock, small and large scale features of glacier erosion, discontinuous, thin veneer of till.

1. Colours derived from the Rock Colour Chart, Geological Survey of America, 1970.

2. The surface Eatonville Hants Till has been designated as Lawrencetown Till in regions south of this map sheet (Stea and Fowler, 1983).

SYMBOLS

- Geological boundary (defined, gradational)
- Structural (strike) ridge
- Glacial striae (ice flow direction known, unknown, 1 indicates older striae)
- Roche moutonnee
- Drumlins, fluted terrain
- Moraine ridge (major, minor)
- Hummocky moraine, hummocks
- Esker (direction of flow known, unknown)
- Delta (ice contact, fluvial)
- Kettle (large, small)
- Sink hole — sh
- Meltwater channel
- Terrace scarp
- Raised beach — RB
- Elevation of delta topset/foreset contact — 15 m
- Fossil locality (buried organics)
- Location of stratigraphic section of special interest (number refers to section, see figure 1)
- Drift thickness spot elevation (metres) — 10 + / 14
- Radiocarbon date — Date / Material; Lab no / Elevation
- Contour interval 50 feet.

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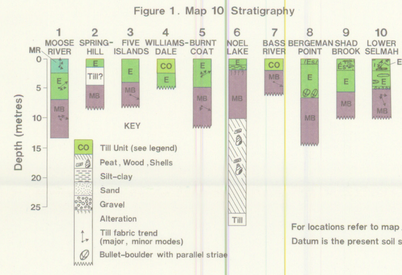
Figure 1. Map 10 Stratigraphy



For locations refer to map
Datum is the present soil s

Cartography by Nova Scotia Department of Mines and Energy.

Base map supplied by Maritime Resource Management Service, Amherst, Nova Scotia.

Contribution to the Canada–Nova Scotia Development Agreement 1984–89. Project jointly funded by Geological Survey of Canada and the Nova Scotia Department of Mines and Energy.

The authors would like to thank D.R. Grant (Geological Survey of Canada) for providing a preliminary air photo interpretation of the region.

NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
MAP 88–13

SURFICIAL GEOLOGY

CUMBERLAND, COLCHESTER, AND HANTS COUNTIES

(SHEET 10)

NOVA SCOTIA

Geology by
R.R. Stea and P.W. Finck

Scale 1:100 000

2 0 2 4 6 8
kilometres

Universal Transverse Mercator Projection