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GEOLOGICAL SURVEY OF CANADA — COMMISSION GÉOLOGIQUE DU CANADA

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MARGINAL NOTES

Introduction

The Margaree map-area was mapped previously by Cameron (1948) and more recently by Lynch et al.(1993). We have significantly modified these previous maps, particularly in documenting sub-divisions of the local Carboniferous succession. Carboniferous rocks, which dominate the Margaree map-area have been emphasized as part of a regional assessment of the stratigraphic framework of the major eastern Canadian sedimentary basins.

Stratigraphy

Pre- Late Devonian Rocks

In the southeastern corner of the Margaree map sheet, pre- Late Devonian rocks are exposed in a triangular area comprising mainly granitoid rocks of Silurian and Devonian age. Associated with the granitoids are several Ordovician to Silurian rock units characterized by schistose metasedimentary rocks and variably altered volcanic rocks. Separated from the Late Devonian and Carboniferous succession by the Big Brook Fault, these 'basement' rocks are presumed to be at least in part representative of those underlying the entire map-area. This triangular outcrop area was compiled directly from Lynch et al. (1993).

Late Devonian and Carboniferous Rock Units

Fisset Brook Formation

At the base of the Devonian-Carboniferous succession, the Fisset Brook Formation records continental volcanism in a rift setting. Dominated by basalt and reaching 400 metres in approximate thickness, the formation also contains minor rhyolite and some associated sedimentary rocks. The latter are typically coarse-grained and red-brown in colour but show considerable variation. In exposures immediately north of the Coulavee Fault, the Fisset Brook Formation appears to interfinger at the top with conglomerates typical of the Creignish Formation at the base of the Horton Group,suggesting that the Fisset Brook and Creignish Formations are both conformable and transitional.

Horton Group

The Creignish Formation is dominated by conglomerate and pebbly sandstone, typically greenish-grey in colour in its lower parts but including significant red-brown intervals higher in the formation. Sandstones are arkosic and poorly sorted. In the middle parts of the formation, we have mapped a discrete member characterized by its pale reddish-grey to almost white colour and by inclusions of dark grey to black shale as detrital clasts. This informal member has been traced from the Coulavee Fault near Margaree Forks, northwards to the limit of the map-area. The Creignish Formation may exceed 1000m in thickness and is transitional upwards into the Judique Formation.

The Judique Formation comprises feldspathic and micaceous, quartz-rich sandstones that interfinger at outcrop scale. Both grey-green and reddish colours have been noted. Intercalated red and grey siltstones occur but are volumetrically insignificant. The sandstones are most characteristically brown when weathered, and may show large white micas on bedding surfaces. Feldspathic varieties are very similar to underlying Creignish rocks but are finer-grained. The associated quartz-rich sandstones are likewise comparable to sandstones in the overlying formations, suggesting that both the lower and upper boundaries of the Judique Formation are transitional. Estimates of thickness for the Judique Formation range from 100-500 metres.

The Strathlorne Formation is dominated by grey to dark grey siltstones with lesser thinly bedded fine-grained quartz-rich sandstones. Near the top of the formation, thin oolitic limestones and algal bioherms 1-3 metres in thickness are intercalated with grey siltstones. The oolitic beds are tabular and relatively continuous in outcrop, whereas the small bioherms are much less extensive. An excellent example of a small algal bioherm is exposed in a small un-named brook flowing southerly off Phillips Mountain west of Northeast Margaree. At that locality, red siltstones and shales are intercalated with more typical grey siltstones of the Strathlorne Formation. The Strathlorne Formation is thought to be of lacustrine origin (Hamblin, 1992). The formation forms a thin but continuous outcrop belt from Margaree Forks to the northern limits of the map-area. Siltstones of typical Strathlorne facies also occur east of the Southwest Margaree River on the southern border of the map-area where they have been traced northwards from the Port-Hood Mabou map sheet (Giles et al., 1996). The thickness of the Strathlorne is estimated to range from 140-200 metres in the Margaree map-area.

Above the siltstone-dominated Strathlorne Formation, Horton Group rocks are highly variable, but are characterized by red-brown colours in fine-grained rock types and a predominance of quartz-rich sandstone, and are assigned provisionally to the Ainslie Formation. Some feldspathic sandstones have also been noted, and grain size ranges up to fine-grained conglomerate at some localities. Occassional beds of grey siltstone are intercalated. In areas where fine-grained sandstones in the Strathlorne become increasingly common, or in areas where the red colour of the Ainslie is subordinate to grey tones, we have found it difficult to map the top of the Strathlorne Formation. In these areas, the Horton Group above the Judique Formation is mapped as a single informal map unit designated CHs/a. Further work is necessary to resolve this stratigraphic problem. In two large domal structures in the southern part of the map-area, this informal map unit may exceed 500 metres in thickness.

Windsor Group

At the base of the Middle to Late Visean Windsor Group, laminated and peloidal limestones of the Macumber Formation comprise a widespread and distinctive lithostratigraphic marker which can be traced throughout the map-area. The Macumber is concordant on upper Horton Group strata in the Margaree map-area, but may be separated from the underlying Horton by a hiatus representing the Early Visean. The Macumber ranges in thickness from 5-12 metres, and is the oldest record of marine sedimentation in the Carboniferous succession of eastern Canada. The top of the formation is marked by the trace of the Ainslie Detachment, a bedding-parallel fault which juxtaposes both upper Windsor and Mabou Group strata on the Macumber Formation (Lynch and Giles, in press).

Lower and middle Windsor Group strata are not well exposed in much of the map-area, and as a consequence have not been formally named. The lowest parts of the Windsor which include thick anhydrite and rock salt, are inferred to be present and shown in cross-sections which accompany the map. Middle Windsor beds are known from only two areas. At Margaree Centre, thick gypsum beds with intercalated variably fossiliferous limestones underlie typical upper Windsor limestone beds in apparent conformable sequence, but are themselves faulted against the Macumber Formation by the Ainslie Detachment. Exposures are inadequate to define even an approximate succession. Biohermal limestones of the middle Windsor Group occur in the valley of the Southwest Mabou River where they appear to underlie an extensive zone of gypsum karst. Again, no details of the middle Windsor succession can be determined from available exposures.

Upper Windsor strata are assigned to the Hood Island Formation, named for its type section on Hood Island located in the adjacent map-area to the south (Giles et al., 1996). The Hood Island Formation is characterized by as many as eight marine carbonate marker beds, each overlain typically by gypsum, and intercalated with fine-grained red-brown sandstones and siltstones which are volumetrically dominant. At the top of the Hood Island Formation, the E1 limestone forms a prominant marker up to 20 metres in thickness. The E1 is dolomitic, thickly bedded except for a well developed basal oolitic facies, and is one of two upper Windsor carbonates to contain rugose corals. Its top is used to define the mappable top of the Windsor Group in the Margaree map-area. At the base of the Hood Island Formation, is an equally distinctive carbonate, termed the Herbert River Limestone, also is rich in rugose corals. Most Hood Island Formation carbonate members have a well-developed oolitic facies, indicating deposition in relatively shallow water. The intervening red-beds are of non-marine origin.

Mabou Group

The Windsor Group is conformably overlain by siltstones and shales of the Hastings Formation, typified by banded buff-weathering dolomitic interbeds and by the common presence of stromatolitic and oolitic limestones. Grey colours predominate, although red-brown fine-grained sandstones are also an important component. Above the Hastings Formation, the Pomquet Formation is almost exclusively red-brown in colour and dominated by fine-grained sandstones and siltstones. The Pomquet and Hastings Formations comprise the Mabou Group which is up to 500 metres thick in the Margaree map-area. The group ranges in age from Late Visean to early Namurian. The top of the Mabou Group is an unconformity, indicated by the mapped relationship with the overlying Port Hood Formation which lies on rocks of both the Pomquet and Hastings Formations.

Cumberland and Pictou Groups

The Port Hood Formation comprises a thick Late Namurian to Westphalian A succession of sandstones deposited in multi-storied channels reaching 30 metres in thickness, separated by red-brown sandstones and siltstones in its lower parts, here assigned to the Margaree Member. In the upper Port Hood Formation, termed the Colindale Member, grey bituminous and carbonaceous shales are characteristic, associated with impure thinly bedded limestones and coal. The Colindale Member hosts the only active coal mining operation in the region at St. Rose. The thickness of the Port Hood Formation in the Margaree map-area reaches 2000 metres.

At the extreme southwestern corner of the map-area, the Broad Cove Formation (Pictou Group) of possible Permian age is faulted against Upper Windsor beds along the Inverness Fault. The Broad Cove Formation, 200 metres in thickness, is concordant and apparently conformable with the underlying Inverness Formation (Cumberland Group) of Westphalian C to Stephanian age, mapped in the Port Hood - Mabou map-area to the south. The Inverness Formation, like the Port Hood, is characterized by thick grey sandstones and pebbly sandstones, with associated grey and lesser red-brown shales and siltstones. Coal is an important constituent of the Inverness Formation. The Inverness is presumed to overlie the Port Hood Formation in the marine areas adjacent to the map-area, but the stratigraphic relationships cannot be determined. In its type area, the Inverness Formation is unconformable on pre-Carboniferous rocks, and on Horton and Windsor Group strata.

Major Structures

Hollow Fault System and other faults

The Coulavee Fault (Timmons - Coulavee Fault of Cameron,1948), the Big Brook Fault and several northeasterly trending faults which intersect the Cameron Brook and Gillis Brook domal structures in the southern parts of the Margaree map-area, are collectively assigned to the Hollow Fault system. A possible northwards trending splay of the Hollow Fault System extends from the vicinity of Margaree Forks to Margaree Harbour. At Margaree Harbour, the fault appears to have normal movement sense, but traced to the south, strike-slip movement may better explain the observed truncation of folded strata and otherwise apparent reverse offsets.

The Inverness Fault is a high-angle reverse fault exposed south of Broad Cove. A second northwesterly fault occurs three kilometres to the east of the Inverness fault and is thought to be also a reverse fault. Small faults have been observed cutting the Port Hood Formation in coastal exposure. Most have normal displacement of minor significance. One normal fault trends northeasterly across the outcrop belt of Port Hood Formation northeast of St. Rose. This fault appears to die out towards the northeast and does not offset the basal beds of the Port Hood.

Ainslie Detachment

In the Margaree map-area and in contiguous areas to the south and east, Windsor Group stratigraphy is complicated by large stratigraphic gaps within which significant portions of the normal succession are absent. At the top of the Macumber Formation, a zone of intense shear marks the trace of a major extensional detachment fault termed the Ainslie Detachment by Lynch and Giles (1995). This detachment has been mapped throughout the map-area as a bedding-parallel fault separating the underlying Macumber Formation from rock units ranging from the middle portion of the Windsor Group to Pomquet Formation (Mabou Group). In the Port Hood - Mabou map-area to the south, associated listric faults and smaller detachment faults occur within the Windsor Group and commonly separate partial sections of Windsor Group rocks but do not cause fault repetition of these strata.

Folds

The most prominant fold structures in the map-area are large anticlinal domes exemplified by the Cameron Brook and Gillis Brook Domes. These features are defined by the Horton Group, capped in each case by the Macumber Formation. At the perimeter of several of the domes, typically in close association with northeasterly-trending faults are tightly folded synclinal keels of Macumber Formation. Dips within the domes vary, but may be quite gentle, as for example in the Cameron Brook Dome. Commonly, attitudes in the outer perimeter of the domes steepen noticably, suggesting that deep-seated normal faults may define the boundaries of the domes. These faults do not appear to extend through the Windsor and Mabou Group cover rocks.

Economic Geology

Mineral production in the Margaree map-area is presently limited to surface mining for coal at St. Rose. Potential exists for large gypsum deposits at Margaree Centre although this site suffers from a lack of readily available transportation. Several of the limestone members of the Windsor Group have historically provided local agricultural lime, and could be a source of high-calcium limestone, albeit in relatively small tonnages.

Metallic mineral occurrences are rare in the Late Devonian and Carboniferous rocks of the Margaree map-area. One new occurrence has been noted east of Margaree Harbour, comprising copper mineralization in calcite vein systems cutting basalts of the Fisset Brook Formation. This small occurrence is most significant in pointing to some potential for base metals in the Fisset Brook Formation, and is itself not considered a major mineral showing.

The fossil fuel potential of the Margaree map-area is largely untested. In particular, grey and black bituminous shales of the middle Port Hood Formation have some potential as petroleum source rocks. Thermal alteration indices suggest possibilities for both oil and natural gas in suitable structures.

Acknowledgements

Field assistance was capably provided by A. Arnott, and B. Creaser. The authors have benefitted from discussions of local geology with G. Lynch, S. Barr, P.W. Durling, D. Sangster, L. Jansa, F. Chandler, T. Hamblin, R. Naylor, J. Calder and K. Gillis to whom our appreciation is extended. Gillis and D. MacNeil provided valuable subsurface data on the Port Hood Formation. Subsurface investigations were assisted by staff of the Core Repository of the Nova Scotia Department of Natural Resources. Particular thanks are expressed to J. Langille, J. Horton, J. Hayes and W. Palmer at that facility.

Palynological assessment was provided by G. Dolby. Additional palynological data were shared by J. Utting. These biostratigraphic data were of fundamental importance to our mapping. C. Currie and P.W. Durling assisted us with digital applications throughout the project. M. MacIntyre, C. Currie and A. Sherin are thanked especially for their fundamental assistance in preparing the map for final release in digital form. G. Lynch and D. Piper improved the maps through critical review which is gratefully acknowledged.

Funding for the work was provided under the Canada Nova Scotia Cooperation Agreement on Mineral Development, supplemented by funds from the National Geoscience Mapping Program (NATMAP). This mapping is a contribution to the Magdalen Basin NATMAP Project.

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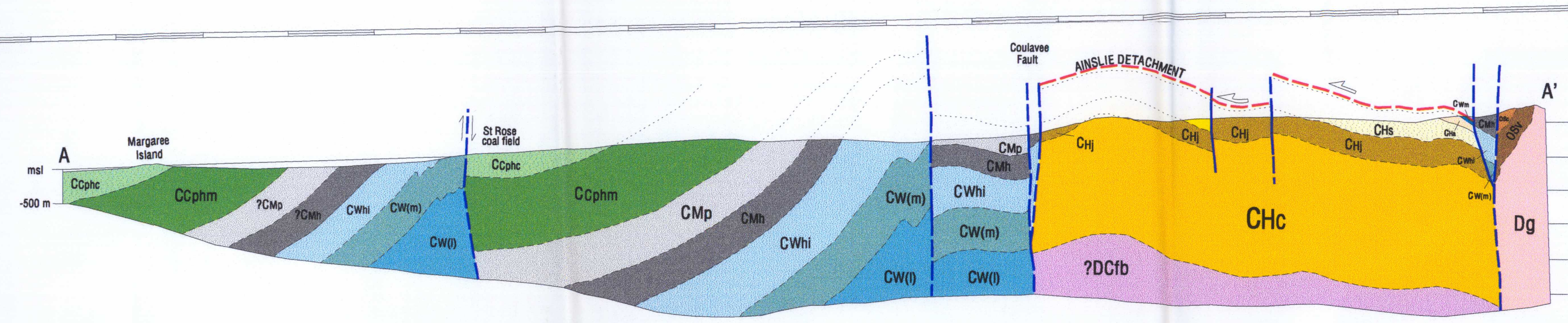
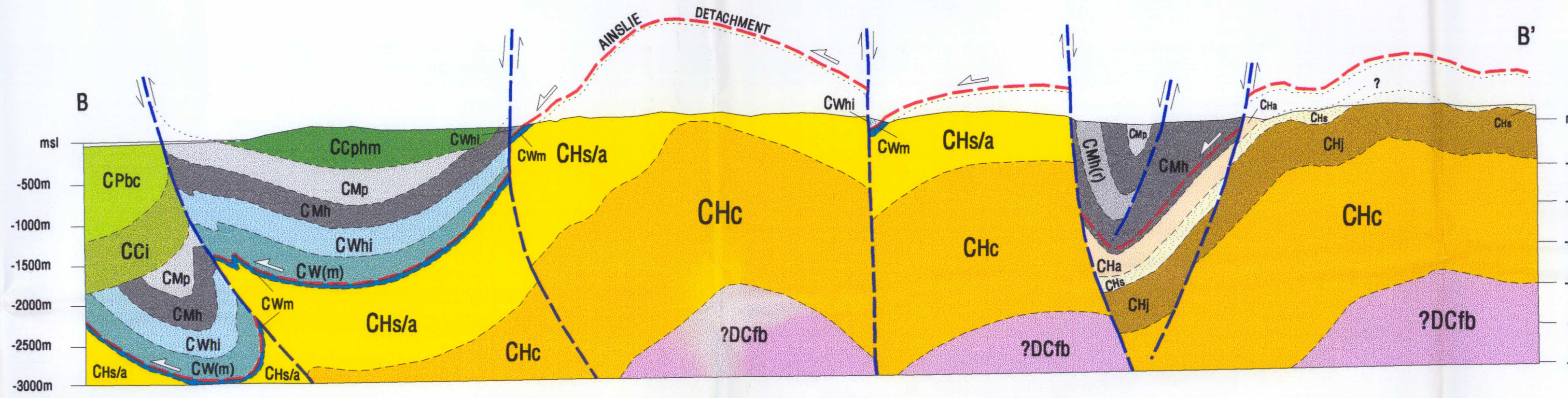
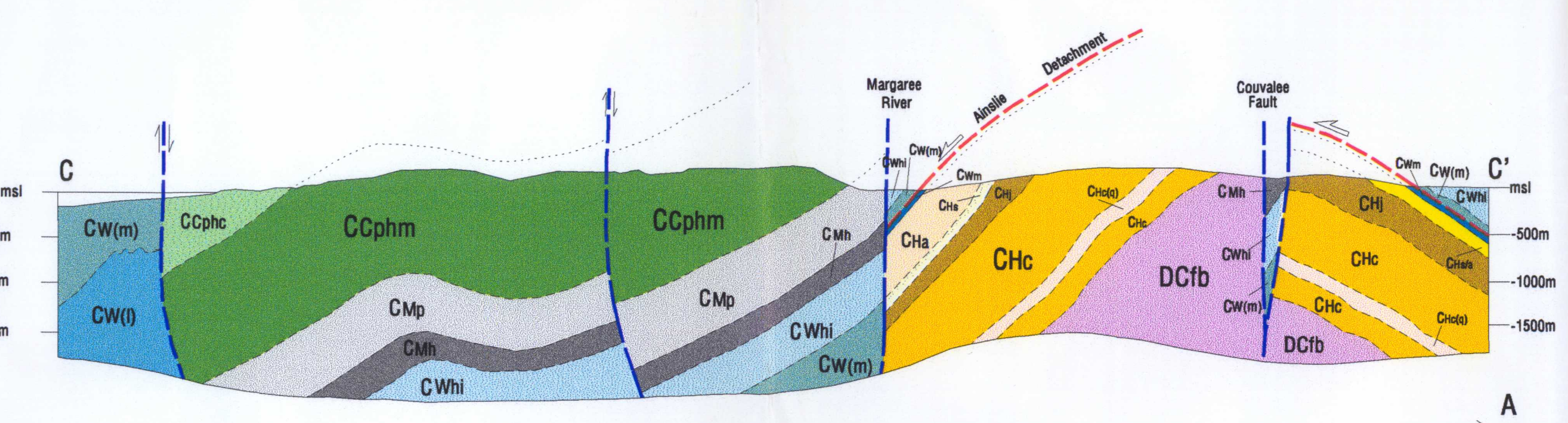
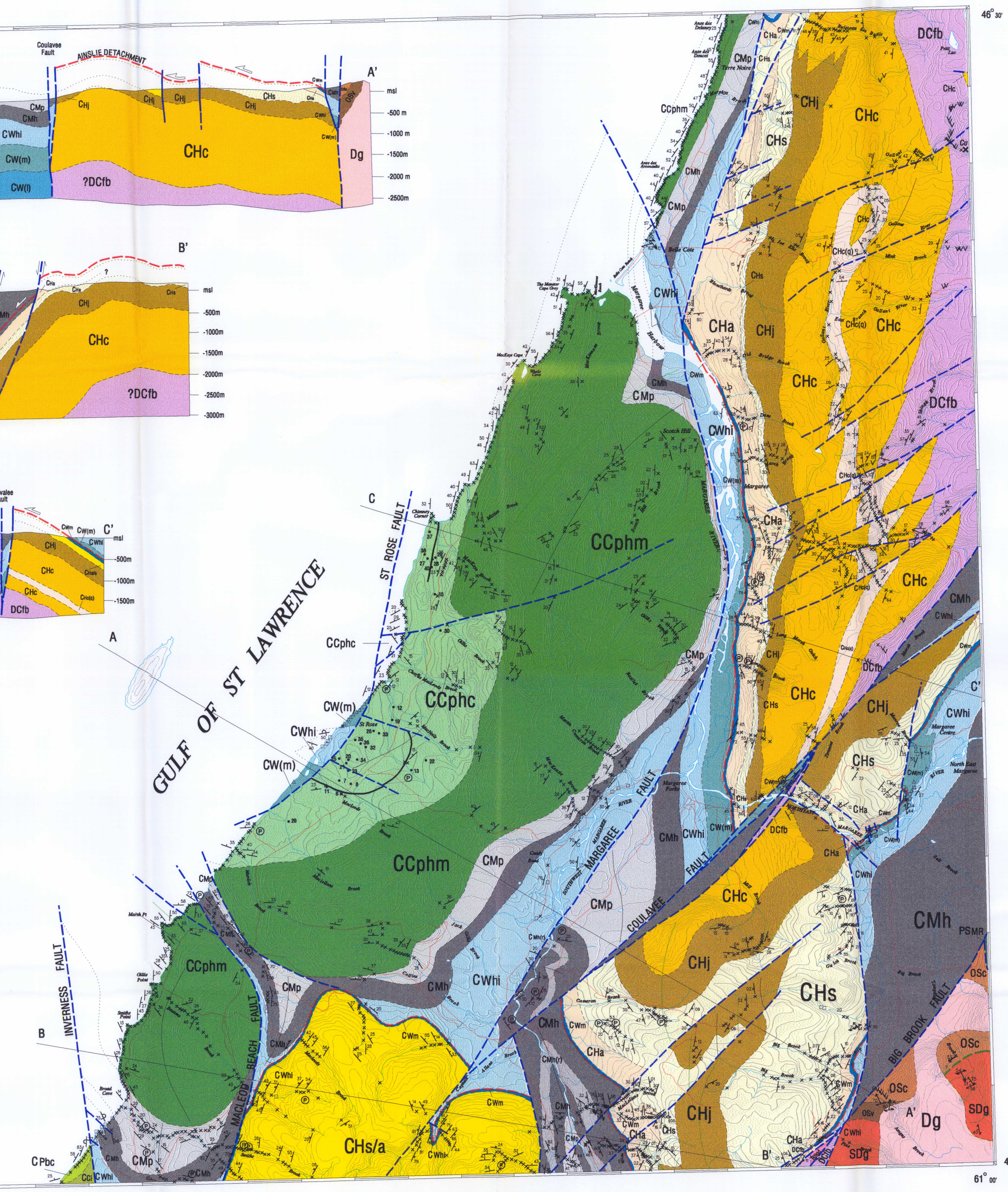








SYMBOLS

ROCK OUTCROP

LEGEND

CARBONIFEROUS TO ? PERMIAN

Pictou Group (CP)

- CPbc — Broad Cove Formation (CPbc): sandstone, pebbly sandstone, minor conglomerate, brick-red in colour

Cumberland Group (Cc)

- CCi — Inverness Formation (CCi): sandstone, grey, arkosic, with associated pebbly sandstone and minor conglomerate: characterized by the presence of coal and grey and red shale

? angular unconformity in the type area

- Port Hood Formation (CCph):
  - CCphc — Colindale Member (CCphc): grey argillaceous and bituminous shales with associated black shales, thin coal seams and impure shaley limestone (fossiliferous); intercalated sandstone in large fluviate channels
  - CCphm — Margaree Member (CCphm): sandstone, grey, fine- to medium-grained in thick tabular multi-storied channel deposits, intercalated with red shales and siltstones

? angular unconformity or disconformity

Mabou Group (CM)

- CMp — Pomquet Formation (CMp): red siltstone, blocky weathering, with thin fine-grained sandstone and minor conglomerates
- CMh — Hastings Formation (CMh): grey shale, with intercalated red shale and siltstone; banded dolomitic silystone with grey shale in the lower parts; thin stromatolitic and oolitic linestones in the lower parts; intervals of red siltstone and sandstone (CMh(r)) occur within the Hastings Formation at mappable scale

conformable contact

Windsor Group (CW)

- CWhi — Hood Island Formation (CWhi): red siltstone, fine-grained sandstone, with intercalated marine limestone, dolostone, and gypsum; halite may be present in the subsurface
- CW(m) — Middle Part (CW(m)) (no formal name applied): limestone, variably dolomitic and fossiliferous, with intercalated gypsum, fine-grained red sandstone and siltstone; halite associated in the subsurface
- CW(l) — Lower Part (CW(l)) (no formal name applied; subsurface only): anhydrite/gypsum, greater than 150 meters in thickness, minor associated laminated carbonate rocks; up to 500 meters thickness of halite may overlie the anhydrite in the subsurface

Ainslie Detachment

- CWm — Macumber Formation (CWm): limestone, laminated peloidal, sparsely fossiliferous to unfossiliferous; calc-mylonite developed near the top of the formation, marking the trace of the Ainslie Detachment

disconformity to angular unconformity (local)

Horton Group (CH)

- CHa — Ainslie Formation (CHa): sandstone, grey, with red and minor grey siltstones and shale; locally mapped with Strathlorne Formation as an undivided informal unit (CHs/a)
- CHs — Strathlorne Formation (CHs): shale, grey, minor red, with thin, tabular oolitic limestone and stromatolitic limestone in biohermal mounds; grey micaceous and quartz-rich sandstone is intercalated and may dominate in significant intervals of the formation
- CHc — Creignish Formation (CHc): sandstone, grey and greenish-grey, pebbly, ranging to conglomerate; sandstone arkosic, moderately sorted with abundant rock fragments; upper parts typically red and brown sandstones of the Judique Facies; formation cut locally by mafic dykes
  - CHj — Judique Facies (CHc(j)): tan, brown and reddish brown fluviate sandstone with minor grey shale; sandstones both micaceous and quartz rich and arkosic
  - CHc(q) — Quartz-rich Facies (CHc(q)): sandstone, pebbly sandstone and minor conglomerate, pale greyish-red to almost white; conglomerate rocks typically contain clasts of dark grey to black shale; occurs as a mappable tabular unit within typical feldspathic facies of the Creignish

conformable contact

(Time scale column: PERMIAN; CARBONIFEROUS — STEPHANIAN; WESTPHALIAN D, C, B, A; NAMURIAN C, B, A; VISEAN LATE, MIDDLE, EARLY; TOURNAISIAN)

LATEST DEVONIAN TO CARBONIFEROUS

- DCfb — Fisset Brook Formation (undivided) (DCfb): basalt, minor rhyolyte, with associated sandstone, conglomerate

unconformity (?): no contact observed

- Dg — granite to syenogranite (Dg), pink equigranular to slightly porphyritic with quartz phenocrysts, biotite-bearing (correlates with Salmon Pool Pluton dated at 365ma, zircon, Jamieson et al. 1986)

SILURIAN-DEVONIAN

- SDg — medium-grained equigranular granite, biotite monzogranite, locally foliated and weakly chloritized (SDg)

ORDOVICIAN-SILURIAN

- OSc — schistose quartz-pebble wacke, siltstone, polymictic meta-conglomerate and meta-sandstone (OSc)
- OSv — schistose chloritic volcanic rocks, metabasalt and mylonitic diorite (OSv)

HADRYNIAN-SILURIAN

- HSgd — granodiorite, variably foliated (HSgd)

PRECAMBRIAN-SILURIAN

- PSMR — Middle River Metamorphic Complex (PSMR): undivided medium to high grade metasedimentary rocks; includes psammatic units, biotite-garnet-kyanite schist, amphibolite, marble

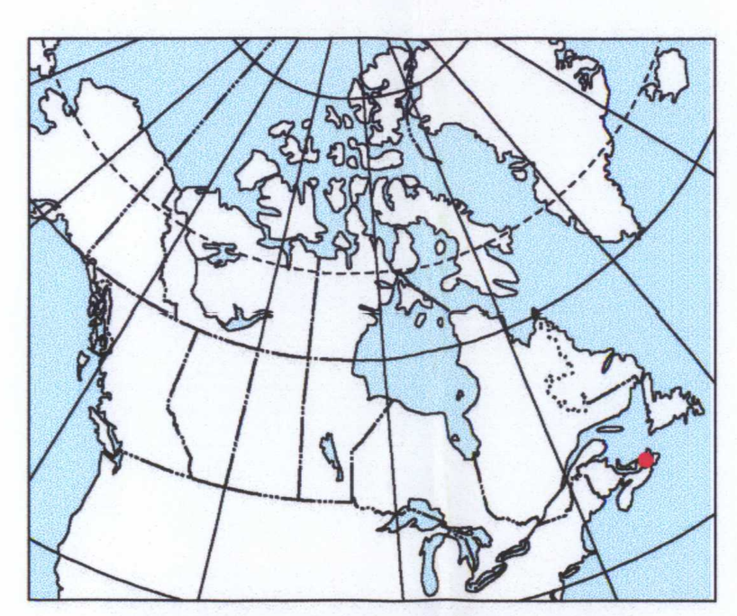
Geology by P.S. Giles, F.J. Hein, and T.L. Allen 1993, 1994; assisted by A. Arnott, and B. Creaser; additional information compiled from Lynch et al. (1993).

Digital base map from Canada Centre for Geomatics published at the same scale. Generalized and modified by the Geological Survey of Canada

Mean magnetic declination 1994, 22°43' West, decreasing 6.8' annually

Recommended Citation:

Giles, P.S., Hein, F.J. and Allen, T.L., 1997: Bedrock geology of Margaree (11K06) Cape Breton Isalnd, Nova Scotia: Geological Survey of Canada OpenFile 3254, 1:50,000 map with marginal notes.



LOCATION MAP - LOCALISATION DE LA CARTE

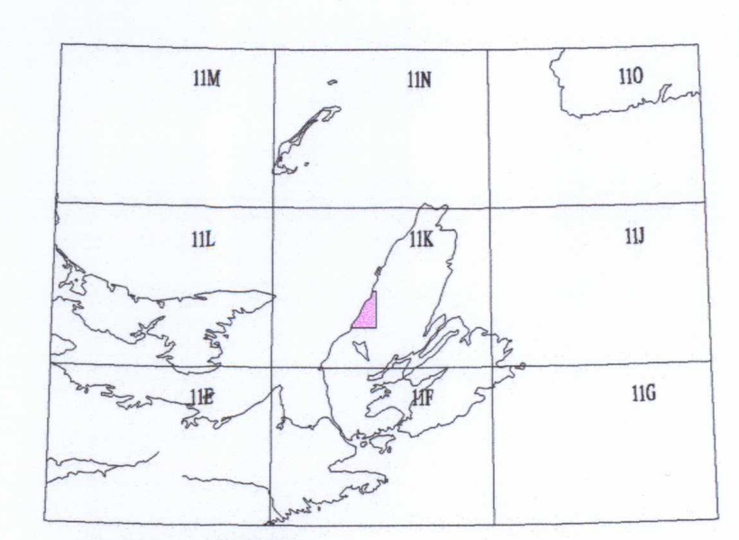
BEDROCK GEOLOGY OF MARGAREE (11K06)

CAPE BRETON ISLAND NOVA SCOTIA

Scale 1:50 000 - Échelle 1/50 000

Kilometres 1 0 1 2 3 4 5 6 7 8 Kilomètres

Contour Interval 50 feet
North American Datum 1983
Universal Transverse Mecator Projection



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GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
OTTAWA
1997

COOPERATION
COOPERATION AGREEMENT ON MINERAL DEVELOPMENT — ENTENTE DE COOPÉRATION SUR L'EXPLOITATION MINÉRALE

Contribution to Canada-Nova Scotia Cooperation Agreement on Mineral Development (1992-1995) a subsidary agreement under the Economic and Regional Development Agreement.

Contribution à l'Entente de coopération Canada - Nouvelle-Écosse sur l'exploitation minérale (1992 - 1995) entente auxiliaire négociée en vertu de l'Entente Canada/Nouvelle-Écosse développement économique et régional.

Canada — Nova Scotia — Province of Nova Scotia