CHAPTER V
PICTOU AREA

INTRODUCTION

The Pictou area is located in Pictou County and includes the Windsor Group outcrop areas near Eureka and Knoydart (Figs. 1-4 and 1-10).

Salt has not been established by drilling in the Pictou area, however, several localities of salt springs have been described by previous workers including Haliburton (1829), How (1869), Hayes (1931) and Cole (1930a). Although the salt springs in the area indicate the presence of salt, the springs are associated with major faults which probably act as access channels for the dissolution of deep salt. Bouguer gravity anomalies indicative of salt are not apparent in the area. Major deep drilling is confined to the Upper Carboniferous coal basins. Exploration potential for salt in this area appears to be very limited.

DUNMAGLASS-KNOYDART

The Dunmaglass area is located approximately 30 km northeast of Sutherlands River and 20 km northwest of Antigonish on the Northumberland Strait shore, western Antigonish County (Figs. 5-1 and 1-10). This area was explored for a potential salt source by a private concern in 1919. Three diamond-drill holes were sunk for the Maple Mountain Salt Mining Company by the Nova Scotia Department of Mines. These holes were drilled to test the source of salt springs and seeps located near Dunmaglass Brook. Descriptions of the drilling results from the Nova Scotia Department of Mines, Annual Report on the Mines (1920), are summarized below:

Borehole No. 1 (D-1, Fig. 5-1), located 18.3 m (60 ft.) east of Dunmaglass Brook, 50.3 m (165 ft.) southwest of the main road, and 311 m (1020 ft.) north of the bridge over Dunmaglass Brook, was stopped at 39.6 m (130 ft.) in "hard brown limestone."

Borehole No. 2 (D-2, Fig.5-1), located 55.5 m (182 ft.) east of the bridge over Dunmaglass Brook, was stopped in "igneous formation", at a depth of 32.1 m (105 ft. 3 in.).

Borehole No. 3 (D-3, Fig. 5-1), located 122 m (400 ft.) northwest of borehole No. 2, was stopped at a depth of 25.9 m (85 ft. 2 in.).

A fourth hole, borehole No. 4 (D-4, Fig. 5-1), was drilled in 1920 (Nova Scotia Department of Mines, Annual Report on Mines, 1921), 289.6 m (950 ft.) north of borehole No. 1, midway between Martin Road and Brook. The hole intersected sandstone and shale with "igneous" rocks to 128 m (420 ft.) and sandstone, shale and limestone to the bottom of the hole at 195.1 m (640 ft.).

Salt was not reported to have been intersected or indicated in any of the drilling and the source for the salt springs and seeps was not located. These holes were apparently drilled in rocks mapped as Lower Devonian, Knoydart Formation by Benson (1974).

The Dunmaglass-Knoydart area was investigated for its potash and salt potential by Pohl as part of a regional study by Hayes (1931). Previous workers who have described the geology in the area include Fletcher (1887), Williams (1914), Bell (1926), Benson (1974) and Boucot et al. (1974). The geology outlined in the following paragraphs is based on mapping by Benson (1974) (Fig. 5-1).

The oldest rocks in the area are located east of Dunmaglass, in the Antigonish Highlands. These rocks were mapped as Browns Mountain Group and were assigned to the Cambro-Ordovician, but are now considered to be Hadrynian-Cambrian by Murphy et al. (1980). A major fault with a north-northeastward trend named the Hollow Fault separates a block of Middle Paleozoic (Silurian-Devonian) sedimentary and volcanic strata on the northwest from the older Browns Mountain Group rocks on the southeast.

To the north of Dunmaglass, the Silurian and Devonian rocks occur in a southwesterly plunging syncline whose southeastern limb is complicated by folding adjacent to the Hollow Fault and whose northwestern limb is apparently overturned (in part).

The Devonian strata occur primarily in the area southwest of McAras Brook as a wedge bound on the southeast by the Hollow Fault, on the northwest by onlapping Carboniferous strata, and pinch out abruptly on the southwest near Bailey Brook. The Carboniferous onlap is defined between Bailey Brook and near McAras Brook where rocks assigned to the Horton, Windsor and Canso Groups are indicated by Benson (1974). Keppie et al. (1978) reinterpreted the Knoydart Point-Moydart Point Carboniferous shore section because of spore ages from the Carboniferous sediments present. The intercalated volcanic and conglomerate sandstone section at the base of the section rests with angular unconformity on the Knoydart Formation. These volcanics were considered by Benson (1974) to be part of the Lower Carboniferous Horton Group, but were assigned by Keppie et al. (1978) to an unnamed group containing rocks of Late Devonian age. In addition, the stratified sandstone and conglomerate section above the volcanic flows (mapped as Rights River Formation of the Horton Group) is now considered to be Upper Windsor based on spore assemblage. A single Upper Windsor (D Subzone?) limestone outcrops on the shore and is overlain with transitional contact by strata assigned to the Upper Windsor and Canso Groups. The Canso-Windsor contact is not identifiable by marked lithologic change and is located somewhat arbitrarily. In the vicinity of Ardness the Windsor Group is indicated to onlap the Devonian Knoydart Formation and is in turn onlapped by the Canso Group.

The presence of evaporites in the Windsor Group in this area has not been indicated by previous workers. The local stratigraphy suggests an Upper Windsor nonevaporitic facies. Evaporities are common in the Lower Windsor in other areas and may onlap in the area to the west and north of this section, beneath the Northumberland Strait. HB Fina F-25, in the Northumberland Strait 50 km north-northeast of

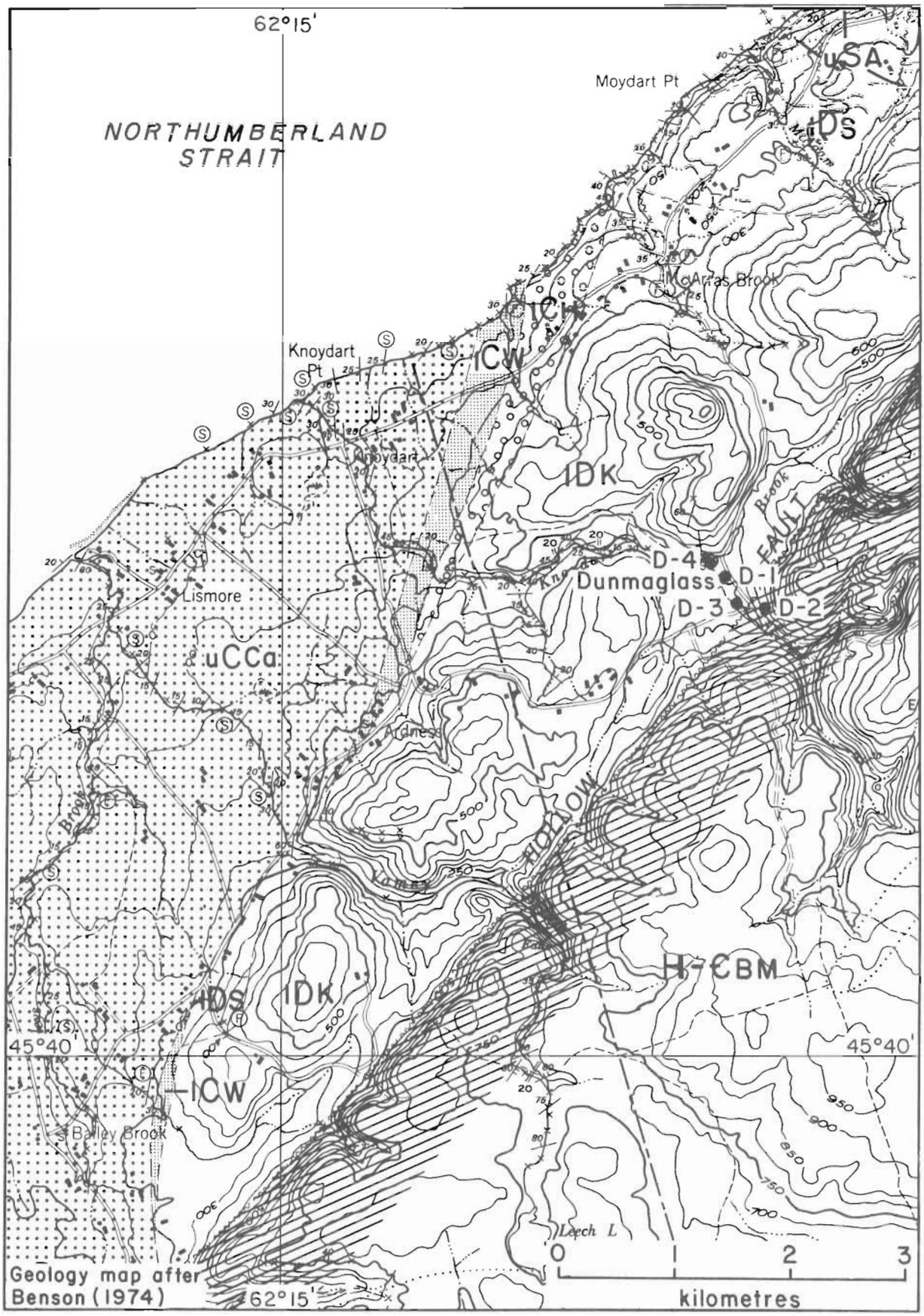


Figure 5-1. Geological map, Dunmaglass, Antigonish County.

LEGEND

UPPER CARBONIFEROUS

UCS — STELLARTON (PICTOU) GROUP
Siltstone and sandstone

UCCU-P — CUMBERLAND and/or PICTOU GROUP(S)
Sandstone, conglomerate and siltstone

UCCU — CUMBERLAND GROUP
Undivided

UCR — RIVERSDALE GROUP
Shale, sandstone and conglomerate

UCCa — CANSO GROUP
Sandstone and siltstone

LOWER CARBONIFEROUS

ICW — WINDSOR GROUP
Sandstone, siltstone, limestone, gypsum and salt?

ICH — HORTON GROUP
Sandstone and conglomerate

LOWER DEVONIAN

IDK — *KNOYDART FORMATION:* mudstone, siltstone and sandstone

IDS — *STONEHOUSE FORMATION:* sandstone and siltstone

UPPER SILURIAN

USA — ARISAIG GROUP
Shale, siltstone and sandstone

HADRYNIAN–CAMBRIAN

H-CBM — BROWNS MOUNTAIN GROUP
Metasedimentary and volcanic rocks

HADRYNIAN

HU — Undivided granitoid and metamorphic rocks

SYMBOLS

Heavily drift-covered area .....
Rock outcrop, area of outcrop .....
Limestone or dolomite outcrop (Faribault-Fletcher maps) .....
Gypsum outcrop .....
Geological boundary (defined, approximate, assumed) .....
Bedding, tops known (inclined, vertical, overturned, horizontal) .
Bedding, tops unknown (inclined) .....
Schistosity (inclined, vertical, dip unknown) .....
Gneissosity (inclined, vertical) .....
Plunge of minor fold .....
Drag fold (arrow indicates plunge) .....
Fault (defined, approximate, assumed) .....
Fault (solid circle indicates downthrow side) .....
Joint (inclined, vertical) .....
Anticline (defined, approximate, arrow indicates direction of plunge) .....
Syncline (defined, approximate, arrow indicates direction of plunge) .....
Fossil locality .....
Spore sample .....
Glacial striae (ice flow direction known) .....
Gravel deposit .....
Quarry .....
Diamond-drill hole ..... DDH●
Borehole ..... BH●
Sinkhole ..... SH○
Salt spring .....
Observed karst topography .....
Drillhole intersecting salt; number (depth to salt, metres) ..... ●IP-1(520)
Drillhole without salt; number (Total depth, metres) ..... ○SR6-1(277)
Drillhole location precise to 150 m .....

MINERALS

Anhydrite	ah	Limestone	lst
Gypsum	gyp	Pyrite	py
Lead	Pb	Zinc	Zn
Celestite	Sr		

McAras Brook (Fig. 5-2), intersected a typical thick section of Lower Windsor salt underlain by anhydrite, thin basal limestone and Horton Group rocks (Keppie et al., 1978).

The Windsor Group in the Dunmaglass area appears to be representative of a marginal clastic facies and is not considered to have good potential for salt.

The depositional environments and lithologies described by Boucot et al. (1974) and others for the Silurian and Devonian rocks in the area are not indicative of evaporitic depositional conditions. A local facies variation containing salt is conceivable but not probable in the area. The salt springs and seeps reported to occur in the Dunmaglass area were not located by Hayes (1931) or other investigators. The drilling by Maple Mountain Salt Mining Company did not locate the source of the brines.

The origin of these brines is problematic. Rock salt has never been reported in the Devonian or older rocks which underlie the area where the springs are reported. The nearest Windsor Group rocks mapped at the surface are nonsaline facies and occur 4 km to the northwest. Salt is known to occur beneath the Gulf of St. Lawrence (Fig. 5-2), but a connection with the pre-Carboniferous basement rocks at Dunmaglass would involve major faulting and migration of saline water.

KEMPTOWN

The geology in the vicinity of Kemptown (Figs. 1-10 and 5-3) was described and mapped by Stevenson (1958). The geology in this area is dominated by several east-west trending faults including the Cobequid, North River and Riversdale Faults which are part of the Glooscap Fault System (Minas Geofracture). These Faults define, at the surface, fault slices of Upper Carboniferous strata comprising Canso, Riversdale and Pictou and/or Cumberland Groups. These fault blocks have been moderately to strongly folded and the section of Riversdale strata exposed on the Salmon River is partially overturned.

Cole (1930a) reported that "Approximately one mile true south of Kemptown, Colchester County, a series of seepages occurs coming out of the steeply dipping rocks on the east bank of a small creek. These seepages have no appreciable flow but are distinctly saline to taste."

Brine from the spring was analyzed by Cole (1930a), and the results are presented in Table 5-1. This spring has a significant quantity of Na_2SO_4 which is not characteristic of a Windsor Group source.

Cole's (1930a) description of the salt spring location places it very close to the North River Fault (Fig. 5-3) that marks the contact between Cumberland and/or Pictou Groups strata to the north and Riversdale Group strata to the south. In this situation the salt of the Windsor Group probably occurs at a depth of more than 1000 m. The brines, if originating from the Windsor Group, are probably migrating upwards along the permeable fracture system developed adjacent to the Fault. Alternatively they may represent formation waters migrating from and through permeable strata of Late Carboniferous age.

Table 5-1. Chemical analyses of Kemptown salt spring*

Sample No		**29**
FIELD NOTES AT TIME OF SAMPLING		
Temperature of atmosphere, °F		75
Temperature of brine, °F		57
Baume degrees		2.5
Equivalent specific gravity		1.016
LABORATORY NOTES		
Specific gravity at 60°F		1.02141
Total solids at 110° C		2.88
Reaction		N
ANALYSES OF SOLIDS		
Na	Per cent	36.62
K	Per cent	0.27
Ca	Per cent	1.09
Mg	Per cent	0.10
SO_4	Per cent	5.90
Cl	Per cent	54.58
Br	Per cent	none
I	Per cent	none
Totals		98.56
HYPOTHETICAL COMBINATION		
$CaSO_4$	Per cent	3.71
$CaCl_2$	Per cent	-
$MgSO_4$	Per cent	0.50
$MgCl_2$	Per cent	-
K_2SO_4	Per cent	0.60
KCl	Per cent	-
Na_2SO_4	Per cent	3.77
NaCl	Per cent	89.98
Totals		98.56

*Cole (1930a)

Windsor Group rocks do not outcrop in the immediate area of Kemptown, but do occur associated with Horton Group rocks in several small fault blocks approximately 10 km to the southwest.

BRIDGEVILLE

Bridgeville is located approximately 15 km south of Stellarton (Fig. 1-4). The geology in this area (Figs. 5-4 and 1-10) was mapped and reported by Benson (1967) and Giles (1982). Fletcher (1892) reported that "At Bridgeville a salt spring issues from beneath a cliff of gypsum ..." This spring has not been located or described by subsequent workers.

Benson (1967) indicated an outcrop band of gypsum along the eastern contact with pre-Carboniferous rocks. Giles (1982) indicated that this gypsum unit (Bridgeville Formation) is underlain by a locally fossiliferous marine limestone unit (Holmes Brook Formation) which rests with angular unconformity on older pre-Carboniferous (Silurian) rocks (Fig. 5-4). This limestone unit is believed to be correlative with the Gays River Formation. A thick section of sandstone with interbeds of limestone (Forbes

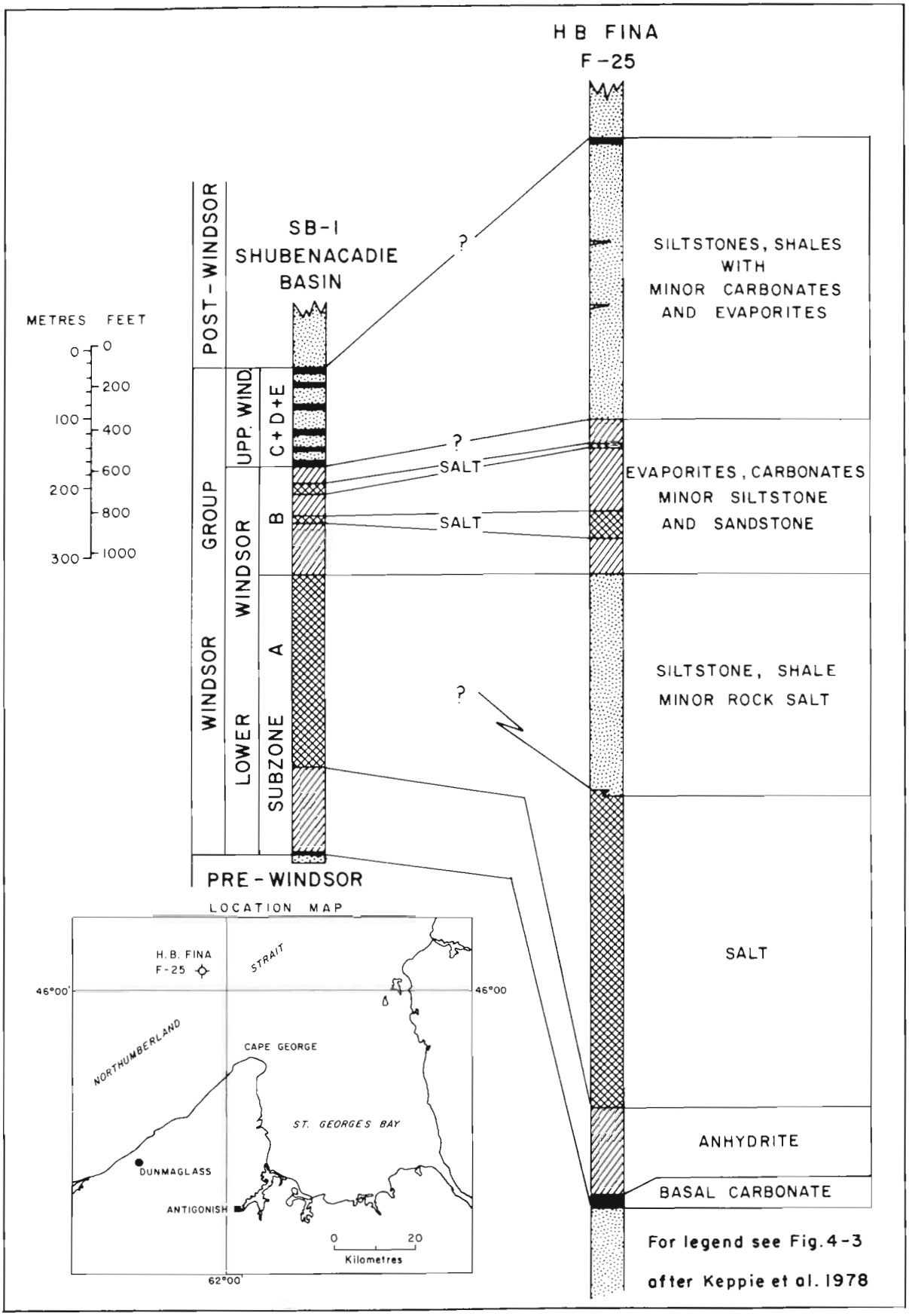


Figure 5-2. Correlation of Windsor Group strata in hole HB Fina F-25, with the Windsor Group of the Shubenacadia Basin.

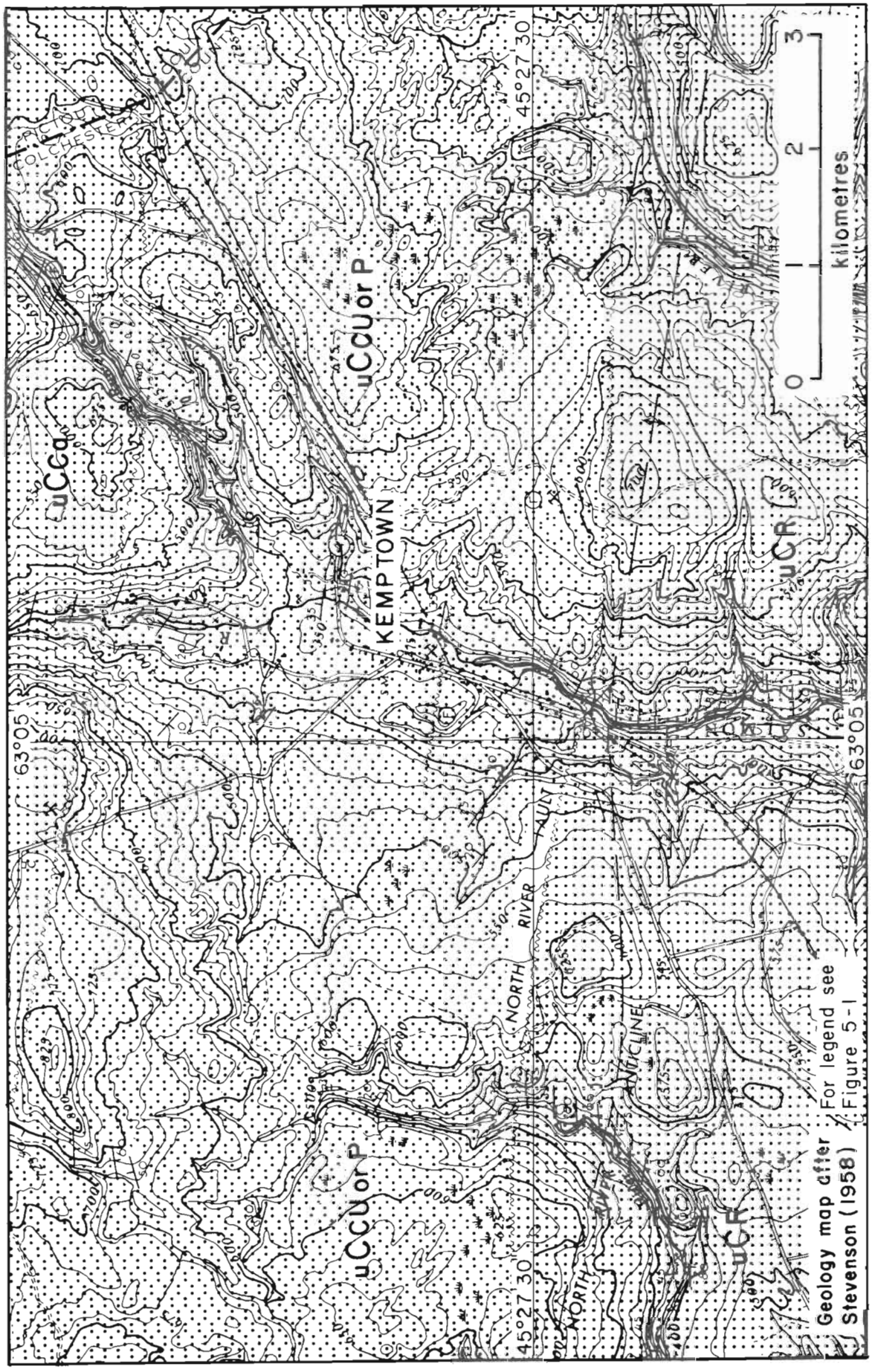


Figure 5-3. Geological map, Kemptown area, Colchester County.

Lake and Churchville Formations) overlies this gypsum and basal limestone section. This section is in turn overlain by Canso Group strata. The Canso-Windsor contact was mapped and described as conformable by Benson (1967) although Giles (1982) indicated local faulted contacts. The southern border of the area is marked by the Chedabucto Fault. According to Giles (1982) this is a complex fault zone that contains many subsidiary faults. This fault zone narrows to the east where the Windsor Group is apparently cut off.

The main salt horizon in the Windsor Group, in most instances, is located above a basal sulphate unit. If this stratigraphic sequence applies in this area the salt should occur above the Bridgeville Formation sulphate and beneath the sandstone and limestone section of the Forbes Lake and Churchville Formations. Giles (1982) indicated an unconformity at this contact. Deep drilling in this area is very rare. In 1978 deep drilling near East River at a location 2.5 km southeast of Eureka (Fig. 5-4) by the Nova Scotia Department of Mines and Energy (1979) and Chevron Canada Ltd. indicated salt is not present in the Windsor Group section at this locality (P. S. Giles, personal communication, 1979). The possibility of occurrence of significant salt deposits in this area is not considered to be favourable.

SALT SPRINGS, PICTOU COUNTY

Salt Springs, Pictou County, is situated approximately 20 km west of Stellarton. The springs from which the community gets its name attracted early interest in possible salt development. The Salt Springs area was the site of the earliest attempt to manufacture salt in Nova Scotia. Cole (1930a) reported that in 1813 a shaft 200 feet deep was sunk in an attempt to locate the source of salt springs and seeps abundant in the area. The brine source was not found. A few years later a small amount of salt was produced by evaporating the brine, but this too was soon abandoned. How (1869) (Table 5-2) first described the salt springs in the area and reported the following analyses.

Table 5-2. Analyses of the salt springs in the Salt Springs area.*

	Grains per Imp. Gal.**
Carbonate of lime	3.775
Carbonate of magnesia	2.932
Carbonate of iron	0.181
Silica	0.560
Sulphate of lime	154.730
Chloride of magnesium	27.330
Chloride of calcium	51.910
Phosphoric acid, boracic acid	-
Bromine, and organic matter	-
Undetermined common salt	4133.500
Total	4374.917
Specific gravity at 53°F	1.04669

*How (1869)

**1 grain/Imp. gal. = 0.01425 gm/l

Cole (1930a) described a salt spring (No. 28) in the area as follows, "On the west bank of West River, to the south of Salt Springs, Pictou County, a series of small springs or seepages occurs just above the river level. These springs are on the farm of D. M. McKay. No appreciable flow is present". This spring is apparently the same as the one described by How (1869) and analyzed by Cole (1930a) (Table 5-3). The major dissolved consituent of the salt spring is NaCl, but it contains minor $CaCl_2$ and $CaSO_4$.

Table 5-3. Analyses of the spring in Salt Springs, Pictou County*.

Sample No.		**28**
FIELD NOTES AT TIME OF SAMPLING		
Temperature of atmosphere, °F		75
Temperature of brine, °F		n.d.
Baume degrees		5.5
Equivalent specific gravity		1.037
LABORATORY NOTES		
Specific gravity at 60°F		1.0425
Total solids at 110°C		5.86
Reaction		N
ANALYSES OF SOLIDS		
Na	Per cent	35.08
K	Per cent	0.30
Ca	Per cent	2.14
Mg	Per cent	0.14
SO_4	Per cent	1.77
Cl	Per cent	57.60
Br	Per cent	none
I	Per cent	none
Totals		97.03
HYPOTHETICAL COMBINATION		
$CaSO_4$	Per cent	2.50
$CaCl_2$	Per cent	3.96
$MgSO_4$	Per cent	-
$MgCl_2$	Per cent	0.54
K_2SO_4	Per cent	-
KCl	Per cent	0.57
Na_2SO_4	Per cent	-
NaCl	Per cent	89.47
Totals		97.04

*Cole (1930a)

The geology in the vicinity of Salt Springs was described and mapped by Faribault and Fletcher (1902). The geology of the area was also described and mapped by Gillis (1964) as part of the northwestern Pictou County area. Windsor Group rocks outcrop sparingly in the area and are apparently only exposed near Limerock, 4 km east of Salt Springs. Murray (1975) reported the occurrence of high-calcium limestone in the vicinity of Limerock. Four shallow diamond-drill holes were drilled by the Nova Scotia Department of Mines to test the quality and extent of the limestone. Locations and logs of these holes may be found in Murray (1975). P. S. Giles (personal communication, 1979) considered the limestone unit present to be part of the Upper Windsor C Subzone.

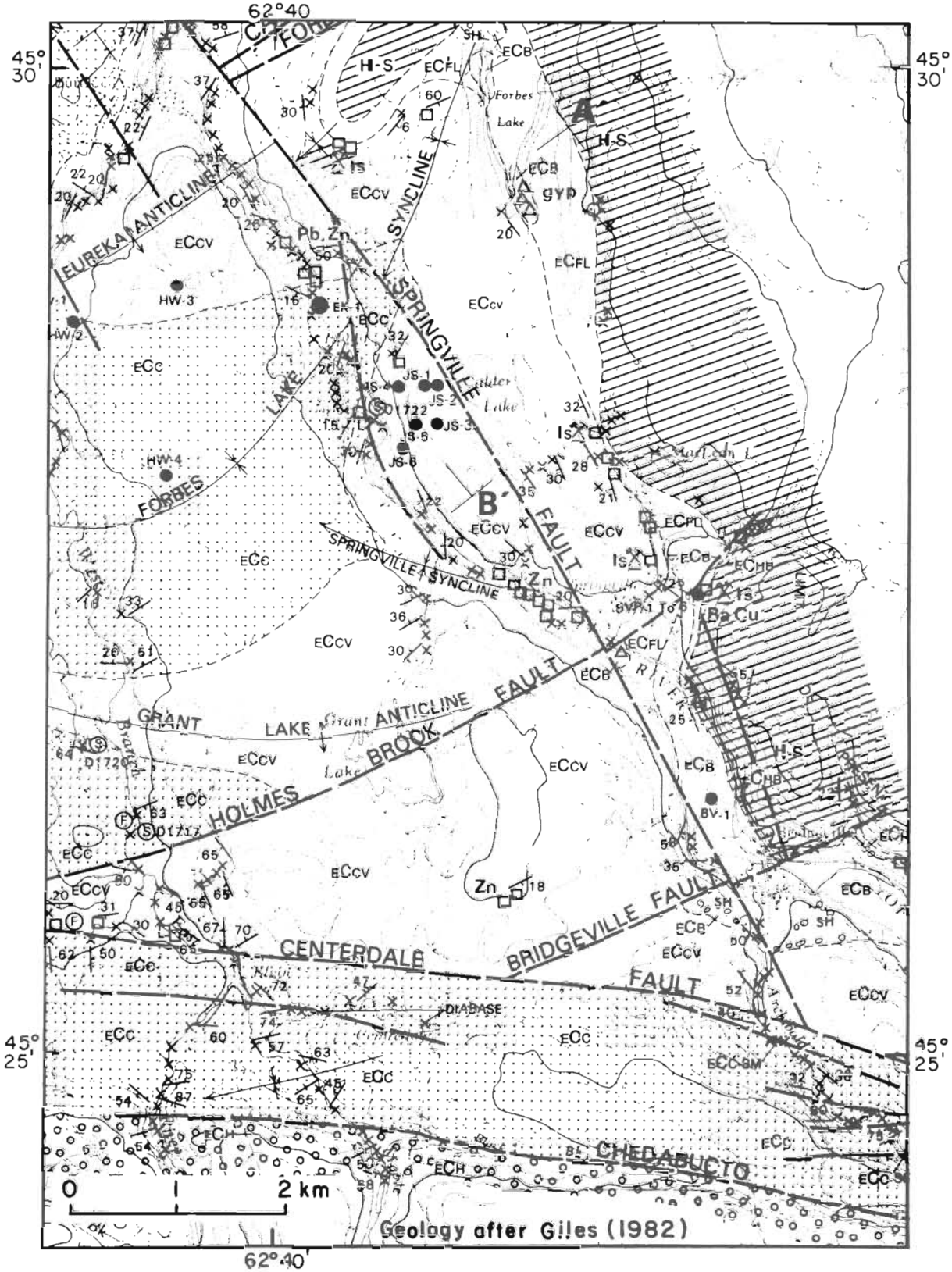
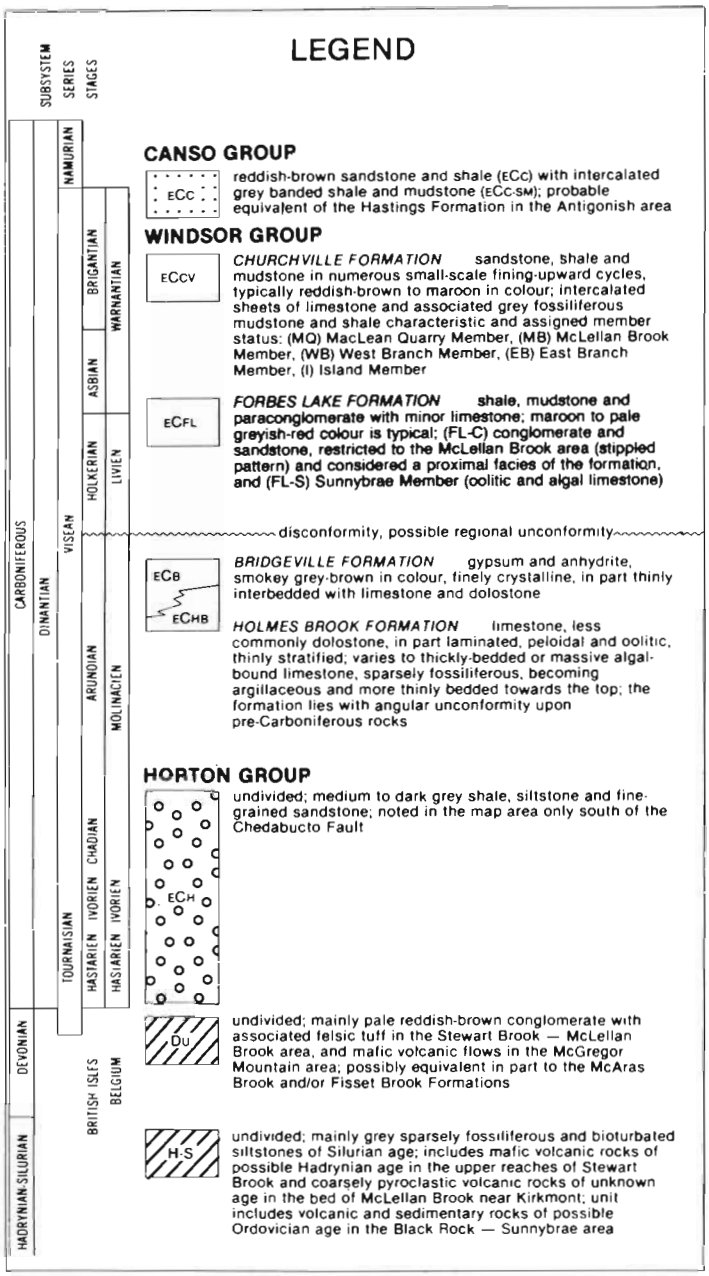


Figure 5-4. Geological map, Bridgeville area, Pictou County.



SYMBOLS

Rock outcrop limestone, dolostone; commonly fossiliferous □
gypsum, anhydrite △
terrigenous sedimentary rocks ×
volcanic rocks V

Bedding: horizontal, inclined, vertical, overturned, tops unknown

Geological boundary, approximate

Fault, approximate

Anticline and syncline

Fossil locality cited in text Ⓕ

Spore locality, GSC Number Ⓢ D1715

Diamond-drill hole

Principal reference section

Water-well used to locate geological boundary

Sink-hole in gypsum SH

Mine or quarry: abandoned **ls**-limestone ls

Mineral prospect: **Pb**-lead, **Zn**-zinc, **Ba**-barite, **gyp**-gypsum, **Cu**-Copper **Pb,Zn,Ba,gyp,Cu**

In 1974 Imperial Oil Limited drilled several deeper diamond-drill holes at Limerock exploring for base metal deposits. Although salt was not encountered in this drilling, drillhole ILR-3 intersected a very steeply dipping (60-80°) section of sandstone and conglomerate to a total depth of 142.3 m (467 ft.) indicating a disturbed section. A steeply dipping fossiliferous limestone unit was reported near the top of the hole, but recovery was poor. The precise relationship of the limestone to the section it overlies and to the section intersected in the Nova Scotia Department of Mines drilling is uncertain. The Windsor Group at this locality occurs as a small fault slice between Canso Group strata to the south and Boss Point Formation to the north. The major West River Fault that passes through the area is part of the Glooscap Fault System. The Salt Springs area is located adjacent to this Fault and it is probable that the salt springs reported in the area are the result of brines derived from Windsor Group salt at depth or are formation water. These brines probably have migrated up permeable fracture zones related to the faulting and possibly through permeable Carboniferous strata. Based upon the available data, the area is not considered to be promising for economic salt deposits.