

## CHAPTER V

### CUMBERLAND COUNTY

#### General Geology

Cumberland County is largely underlain by Pennsylvanian sediments of freshwater origin, but at, or near, the southern border of the county there is a belt of volcanic and intrusive rocks and altered sediments. They form an elongated upland (the Cobequid upland), nearly 100 miles long, averaging about 900 feet above sea-level, and trending north  $80^{\circ}$  east.

The Carboniferous unmetamorphosed sediments lying north of the Cobequid upland, form the bedrock of an undulating lowland, averaging about 200 feet above sea-level, that extends from Cumberland County westward beneath the Bay of Fundy, northward into New Brunswick, and eastward into Pictou County and under the Northumberland Strait (Bell, 1944).

The Windsor Group, containing the only economic limestones and dolomites, occurs as thin bands running through the middle of the County from the Cumberland Basin on the west to Wolloce on the east. There is also a narrow band of Windsor rocks in the Porsbaro area. The limestone is not very abundant in these areas and very few deposits appear to be very extensive.

#### AMHERST AREA

##### AMHERST (1-1)

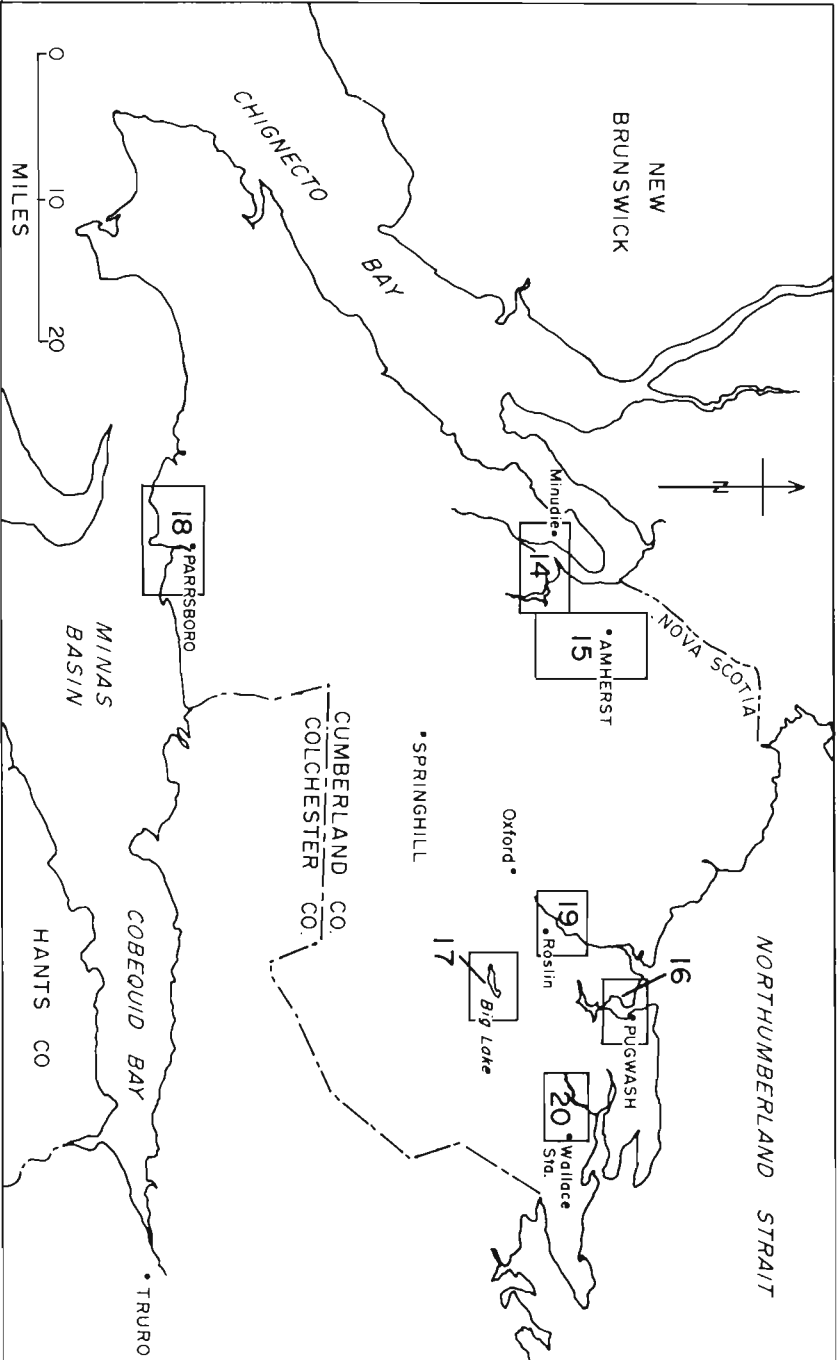
This occurrence is located in a quarry on the Lime-kiln Brook (Plate 41), approximately 3 miles southeast of the town of Amherst. The quarry is located 1.5 miles due east of the Amherst-Springhill highway. The quarry can be reached by an old road which once serviced the quarry and is still passable. The quarry is 1.1 miles up this road from the turn off on the Upper Nappan-Brookdale road. (See Figure 15, page 82)

#### Description

It is a grey, hard, dense, medium-grained, massive, fossiliferous, dolomitic, Windsor limestone. The weathered surface is light brown. In some sections the bedding is poorly developed and massive, in others, the limestone is thinly bedded and well developed. There are a few oncaltic and nodular sections in the limestone. There are very few calcite veins. This occurrence strikes N  $62^{\circ}$  W and dips  $57^{\circ}$  NE.

The limestone is 50 to 60 feet thick. A large amount of limestone has been taken out of the quarry along strike.

The surrounding area is heavily wooded but is readily accessible.



Key Map 2. Location of Figures 14 - 20 inclusive, in Cumberland County.

Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Am-1-1	39.86	10.10	4.28	33.10	12.30

## AMHERST (1-2)

This limestone outcrop is a continuation of occurrence Am-1-1. It can be found outcropping in a 30 foot embankment along the side of the Lime-kiln Brook, 4,686 feet upstream from the lime quarry. The limestone forms the bank of the brook with a dip of 69°. (See Figure 15, page 82 )

Description

This limestone is greyish brown, hard, slightly conglomeratic, coarse-grained at the top of the section grading into a grey, hard, dense, fine-grained, oncolitic, Windsor limestone. The bedding is well developed with a brown, nodular weathered surface. There are no visible calcite veins. The limestone is striking N 60° E and dipping 69° NW.

The limestone dips into the brook at this point, parallel to the brook, so that no thickness can be seen. It is assumed, however, to be the same section as that found in the quarry which is 50 to 60 feet thick.

The surrounding area is heavily wooded and is not readily accessible.

Analysis

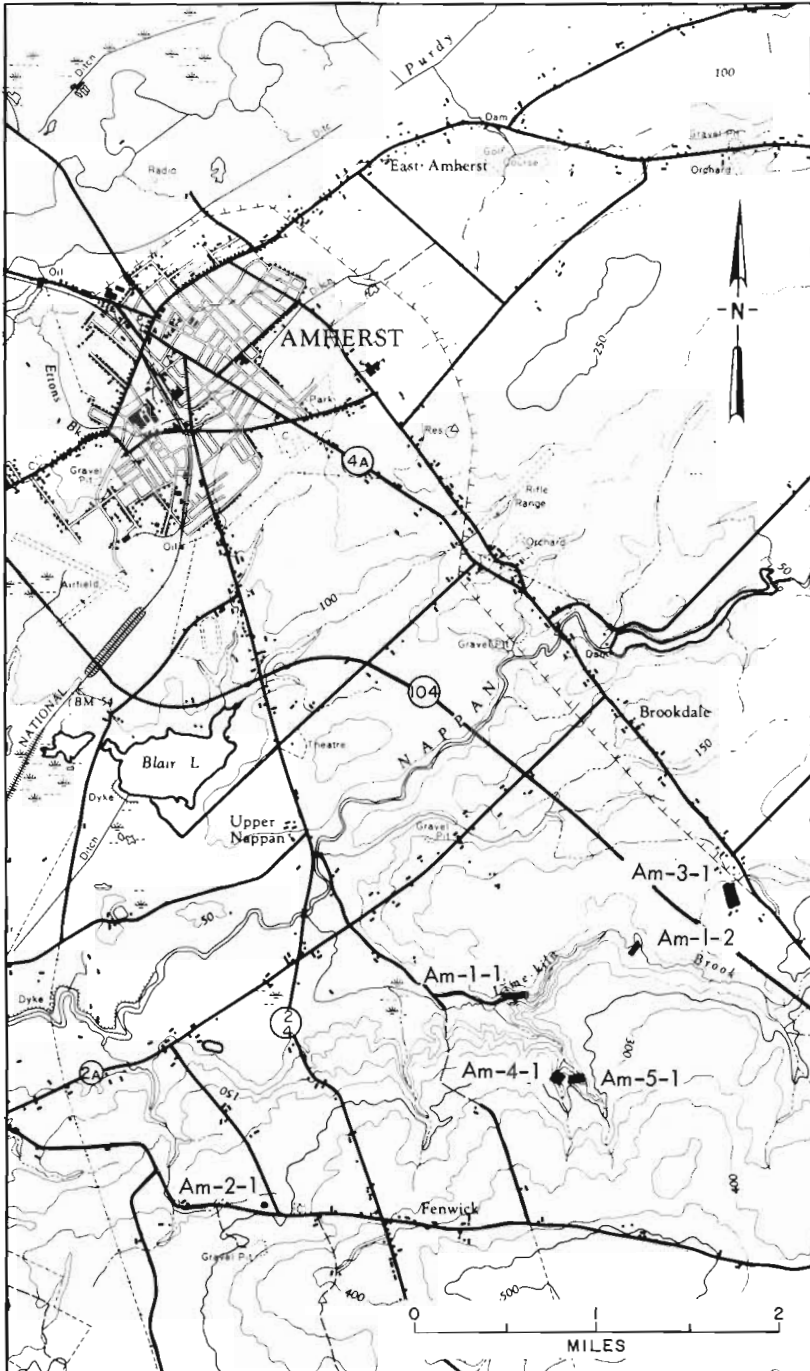
Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Am-1-2	36.30	13.50	4.40	44.80	0.85

## AMHERST (2-1)

This occurrence of dolomite is located approximately 3 1/2 miles south of the town of Amherst. This dolomite outcrops at the south end of the Higgs Road, 1/2 mile west of the intersection at Fenwick on the Amherst-Springhill highway. The outcrop is located in a field, 60 feet west of the Higgs Road. The outcrop covers an area of approximately 100 square feet and stands 4 feet higher than the surrounding terrain. This is the only dolomite visible in the area. (See Figure 15, page 82 )

Description

It is a greyish brown, hard, dense, granular, massive, slightly fossiliferous, Windsor dolomite. The bedding is very poorly developed with a light brown weathered surface. It contains a few cavities. The dolomite appears to strike in a northerly



Ref. Map 21-H-16-E

Figure 15



Plate 41. Limestone quarry located 3 miles south of Amherst on the east side of the Amherst-Springhill highway at Fenwick, Cumberland County. (Am-1-1)



Plate 42. Outcrop of limestone found in the intertidal area along the Maccan River at Lower Maccan, Cumberland County. (LM-1-1)

direction and dip towards the west, but because of its massive nature the attitude is difficult to measure.

There is no indication as to the thickness of the dolomite. The overburden does not appear to be of any great thickness.

The surrounding area is flat and open farmland.

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Am-2-1	44.10	4.90	3.08	29.10	18.30

#### AMHERST (3-1)

This occurrence is located on the west side of the Oxford-Amherst highway, 3 miles south of Amherst. This limestone is found outcropping in a quarry behind the farm of F. Crawford Kinnear. The limestone can be found on the west side of the road in a mound which parallels this road. The quarry is marked on the topographic map of the area. A manganese pit was dug at one time behind the Kinnear farmhouse. (See Figure 15, page 82)

#### Description

It is a grey, hard, fine-grained, slightly metamorphosed Windsor limestone. Certain sections of the limestone are nodular (oncolitic) and contain small patches of white barite and calcite. The bedding is very poorly developed and is mainly massive with a light grey, rough weathered surface. There are numerous faults in the area. The limestone is interlayered with a red sandstone and conglomerate, 2 to 3 feet in thickness. The limestone, generally, is very impure. In the quarry the limestone is striking N 12° E and is dipping approximately 80° NW. In the mound to the north of the farmhouse, the limestone appears to strike north or slightly northwest. The section would appear to be at least 50 feet thick with very little overburden.

The limestone is in faulted contact with the Pictou Group, the Boss Point Formation and the Conso Group.

The surrounding area is open and readily accessible

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Am-3-1	42.40	2.59	1.06	53.70	0.73

## AMHERST (4-1)

This occurrence of impure dolomite is located on a brook which runs north and joins the Lime-kiln Brook just west of the limestone quarry (Am-1-1) located on the Lime-kiln Brook. The limestone can be found outcropping on the west branch of this small brook, 430 feet upstream from where the east branch joins. This area is approximately 1 mile east of the Amherst-Springhill highway and 1.7 miles southeast of Upper Nappon. (See Figure 15, page 82)

Description

It is a brown, hard, slightly porous, massive, medium-grained, Windsor dolomite. The weathered surface is smooth and brown with poorly developed bedding. This dolomite contains some fossils, essentially crinoid stems. Some sections of the dolomite are very hard and compact. It appears to strike N 38° W, but because of the limited outcrop area, the dip could not be measured. It seems, however, to be steeply dipping towards the southwest.

The dolomite strikes across the brook in a 30 foot high mound with very little overburden covering it. The dolomite is, however, overlain by a red and grey conglomerate. The limestone is 15 to 20 feet thick.

The area is very heavily wooded and is not easily accessible.

Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Am-4-1	40.75	10.20	5.75	27.30	15.20

## AMHERST (5-1)

This occurrence is found on the east branch of the brook which runs into the Lime-kiln Brook just west of the limestone quarry (Am-1-1). This limestone is east of Am-4-1 and 1,200 feet upstream from where the east and west branches of the brook join. The limestone is found in both banks and also in the brook. The limestone can be found outcropping up the east bank for a distance of almost 75 feet. The bank rises up from the brook for a distance of approximately 150 feet on both sides. (See Figure 15, page 82)

Description

It is a light grey, hard, dense, fine-grained, compact, nodular, Windsor limestone. The weathered surface is light grey and nodular with very poorly developed bedding. There is very little indication as to the strike and dip because of the massive nature of the limestone, but it appears to strike in a northeasterly direction and dip towards the southwest. The limestone would appear to be fairly thick with no indication as to the thickness of the overburden.

The surrounding area is very hilly, heavily wooded and very inaccessible.

#### Analysis

Sample	L.O.I. (%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Am-5-1	41.70	3.49	1.59	52.80	0.57

#### BIG LAKE AREA

##### BIG LAKE (1-1)

This occurrence of siliceous limestone is located approximately 1 mile north of Big Lake and on the south side of the brook which drains McPherson Lake. The limestone is located in the brook and in a mound 980 feet up this brook from where it joins the Pugwash River and flows north. The limestone also outcrops near the top of a 35 foot high hill which runs along the south side of the Brook. (See Figure 17, page 87 )

#### Description

It is a grey, hard, slightly porous, siliceous, medium-grained, Windsor limestone. It contains worm burrows which are one-quarter to one-half an inch in diameter. The bedding is well developed with a smooth, grey weathered surface. The limestone is thinly bedded in sections and slightly nodular in other sections. It strikes N 35° W and dips 54° NE.

There is no indication as to the thickness of the limestone because of the small areal extent of the outcrop. There appears to be very little overburden.

The area is very heavily wooded and not easily accessible. It is at least 3/4 mile from the nearest road.

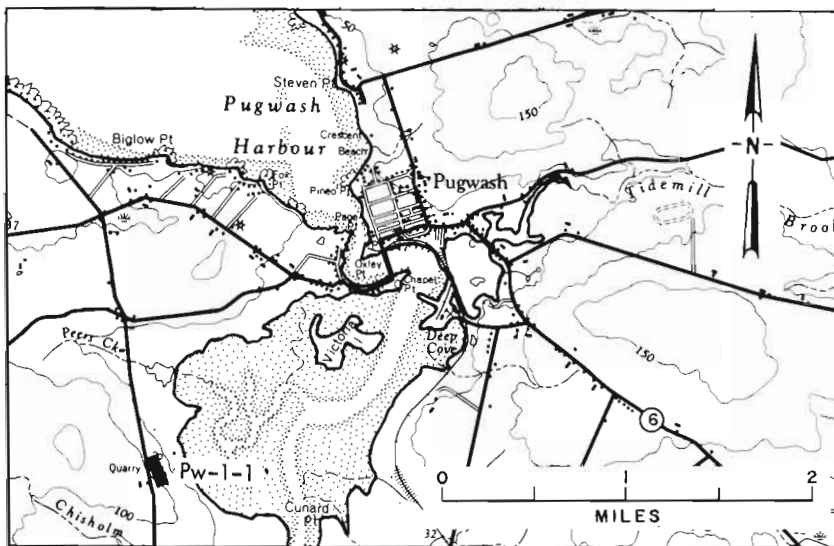
#### Analysis

Sample	L.O.I. (%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
BL-1-1	30.30	22.99	8.75	33.15	3.13

#### LOWER MACCAN AREA

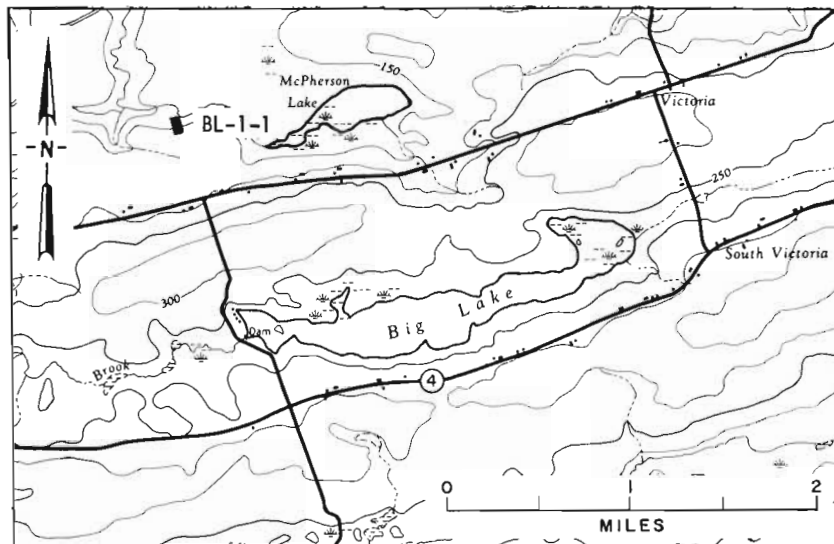
##### LOWER MACCAN (1-1)

This occurrence is located at Lower Maccan along the south shore of the Maccan River, 1.3 miles east of Amherst Point where the River Hebert joins the Maccan River. The limestone outcrops along the shore northeast of the school, at the mouth of a small brook which crosses the road at Lower Maccan. The main part of the outcrop is



Ref Map 11-E-13-E

Figure 16



Ref Map 11-E-12-E

Figure 17

below high tide level but is above low tide level (Plate 42). The limestone also outcrops in a 6 to 10 foot embankment along the edge of the shore. The strike of the limestone parallels the shore and dips inland under mainly open fields. This occurrence would appear to be a continuation of Md-1-1. (See Figure 14, page 77 )

#### Description

It is, for the most part, a grey, hard, petroliferous, fine-grained, oncolitic, fossiliferous, magnesium, Windsor limestone. The limestone grades from a hard, yellowish green section near the bottom into an oncolitic section, into a large nodular section (Plate 44), into a fossiliferous section and finally into a thickly bedded section at the top (Plate 43). The fossils are mainly brachiopods with numerous worm burrows. There are numerous calcite veins. The bedding is well developed with a light grey weathered surface. It strikes N 70° W and dips 21° SW.

The limestone can be traced for approximately one mile along the shore, mainly to the east of the mouth of the small brook. The limestone is 30 to 40 feet thick with a possibility of large amounts of overburden inland.

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
LM-1-1	41.10	5.60	3.60	42.00	5.90

#### MINUDIE AREA

#### MINUDIE (1-1)

This occurrence is located along the west shore at Minudie where the Maccan River and the River Hebert join and flow into the Cumberland Basin. The outcrop area is due west of Amherst Point and is 3/4 of a mile southeast of Minudie. The limestone outcrops along the shore, both above and below high tide level. The main outcrop is below high tide level and just above low tide level. (See Figure 14, page 77 )

#### Description

It is a dark grey, hard, dense, fine-grained, oncolitic, Windsor limestone. The basal section ranges from an oncolitic limestone up to a semi-laminated limestone and then into a massive limestone with the upper section of the limestone being clayey and nodular. The limestone gives off a bituminous odor. There are a few calcite veins along fractures. The bedding is well developed with a light grey weathered surface. Due to the folding, the strike and dip vary somewhat, but generally it strikes N 85° E and dips 21° SE.



Plate 43. Outcrop of flat lying limestone found along the shore of the Maccan River at Lower Maccan River, Cumberland County. (LM-1-1)



Plate 44. Same location as above showing nodular nature of the limestone at Lower Maccan, Cumberland County. (LM-1-1)

The limestone is at least 20 to 30 feet thick. There is very little overburden in the vicinity of the shore, however, inland it appears to increase.

The limestone is overlain by an arkose of Cansa age.

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Md-1-1	39.60	6.20	2.72	49.20	0.48

#### PARRSBORO AREA

##### PARRSBORO (1-1)

This occurrence is located along the shore of the Minas Basin approximately 4 miles southeast of the Town of Parrsboro. The occurrence can be found outcropping at Clark Head which is at Greenhill. The limestone is found in a 75 to 100 foot high cliff and forms the bank at this point. (See Figure 18, page 91 )

#### Description

It ranges from a greyish black, hard, dense, argillaceous, well-bedded limestone to a massive, light grey, very hard, compact, Windsar limestone. There are numerous veins and stringers of pink and white calcite. The veins and stringers generally cut across the bedding but some run parallel to it. Others are very irregular. The limestone has been altered a great deal due to mafic intrusions in the area. It strikes N 70° W and dips 66° SW. The limestone is underlain by a light brown, arenaceous argillite.

The limestone is 40 to 50 feet thick in a few sections but generally is quite a bit thinner than this due to the extensive weathering along the shore of the Minas Basin. There is no overburden.

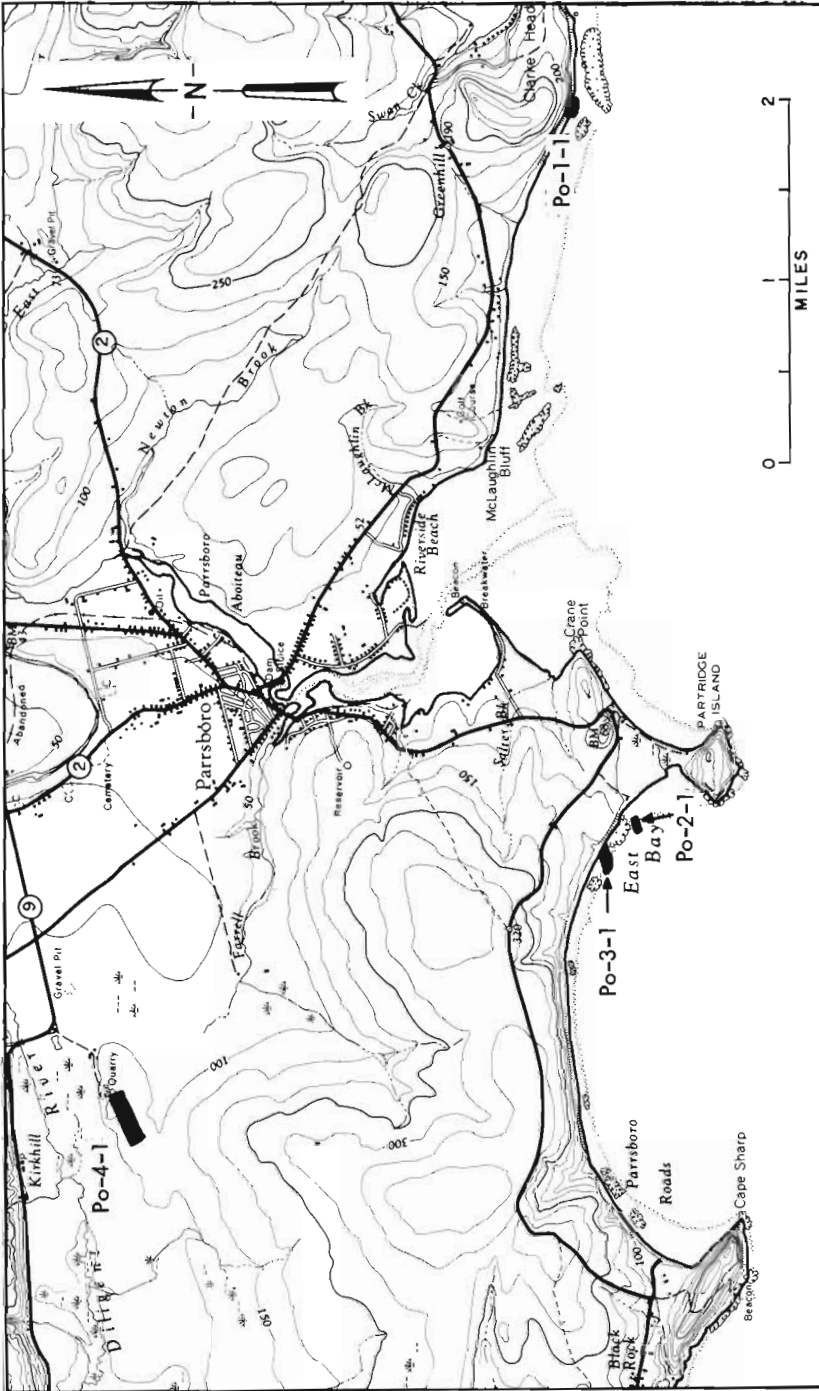
The limestone can be traced along the shore for a distance of 150 feet (along strike).

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Pa-1-1	41.85	2.80	1.88	51.70	1.44

##### PARRSBORO (2-1)

This occurrence is located approximately 2 miles south of the town of Parrsboro. The limestone can be found outcropping 15 to 20 feet in elevation below high tide level on the shores of East Bay, 0.5 miles northwest of Partridge Island. The limestone out-



Ref. Map 21-H-8-W

Figure 18

crops one-half mile west of Ottawa House. The limestone strikes away from the water and back towards the cliff but does not outcrop inland. (See Figure 18, page 91 )

#### Description

It is a dark grey, hard, dense, argilloceous, siliceous, medium-grained, Windsor limestone. The bedding is well developed with a grey, smooth weathered surface and it strikes N 79° E and dips 36° NW. There are numerous calcite stringers and a few fossils (small worm burrows?).

The limestone is at least 15 feet thick but the entire thickness cannot be seen. A large amount of overburden is present inland, making the limestone of very little economic value.

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Po-2-1	37.45	11.70	2.95	44.75	1.89

#### PARRSBORO (3-1)

This occurrence is located 660 feet northwest of Po-2-1 along the shore of the Minas Basin (Plate 45). This impure limestone can be found striking away from the water and back into the embankment. The limestone can also be found outcropping 10 to 15 feet in elevation below high tide level. The limestone appears to be faulted off where it joins the embankment. A small brook has cut down through it and the limestone cannot be found on the other side of the brook. (See Figure 18, page 91 )

#### Description

It is a dark grey, hard, medium-grained, highly argillaceous, siliceous, fossiliferous, Windsor limestone. The bedding is very well developed with a light grey, smooth weathered surface and strikes N 65° E and dips 65° NW (Plate 46). The fossils are abundant with the majority being brachiopods, both large and small. There are also a few gastropods and some long thin rounded structures (worm burrows?). There are a few irregular calcite stringers. Joints and fractures are abundant in the limestone.

The limestone is 30 to 40 feet thick with some interbedded bands of limy shale.

The entire limestone section can be seen along the shore.



Plate 45. Steeply dipping limestone found along the shore of East Bay, 2 miles southwest of Parrsboro, Cumberland County. (Po-3-1)



Plate 46. Close-up of the above outcrop showing the thin bedding of the limestone at the top of the section. (Po-3-1)

Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Po-3-1	28.90	26.40	10.30	28.90	4.50

## PARRSBORO (4-1)

This occurrence of limestone is located 2.2 miles northwest of the town of Parrsboro, at Kirkhill. The limestone can be found outcropping in the floor of an old lime quarry. The quarry has not been used for many years and is now being used as a dump for old cars. The limestone occurs as rubble along the sides of the quarry. This quarry is 0.2 miles west of the farmhouse which is just south of the Department of Highways shed. (See Figure 18, page 91 )

Description

It is a dark grey, hard, dense, slightly laminated, Windsor limestone. The bedding is well developed with a buff coloured and smooth weathered surface. There are numerous small calcite stringers and veins running in all directions. There is some associated coal material. There is no indication as to the dip or strike due to the lack of outcrop in the area. Goudge (1934) states that the limestone has a nearly vertical dip, strikes east and is 50 feet thick.

There is not much overburden and the limestone can be traced west from the farmhouse for a distance of approximately 1,000 feet along the quarry road.

Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Po-4-1	42.05	2.49	1.50	52.60	0.55

## PUGWASH AREA

## PUGWASH (1-1)

This occurrence is located approximately 2 miles southwest of the town of Pugwash. The limestone is found in a quarry (Plate 47), east of the road running along the west side of the Pugwash River. This road runs from Pugwash to Conns Mills. The quarry is approximately 700 feet long and 40 feet wide. (See Figure 16, page 87)

Description

The limestone is hard, light grey, very compact, oncolitic, fine-grained, dolomitic, and belongs to the Windsor Group. The bedding is very well developed and is thickly bedded. The weathered surface is light grey. There is a large amount of



Plate 47. Limestone quarry located along the west side of the Pugwash River, 2 miles southwest of Pugwash, Cumberland County. (Pw-1-1)



Plate 48. Outcrop of limestone found in the above quarry showing algal "cigars" and steeply dipping strata. (Pw-1-1)

calcite along the bedding surface which shows slickensiding, indicating horizontal movement along the bedding plane. The limestone varies a great deal throughout its thickness. The lower portion of the limestone has a large amount of red siltstone associated with it, while the upper portion shows "algal cigars" (Plate 48). It strikes N 43° W and dips 76° NE. The limestone is underlain and overlain by a red siltstone with another thin layer of limestone overlying the upper siltstone.

The limestone is 30 to 35 feet thick with little or no overburden.

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CoO(%)	MgO(%)
Pw-1-1	41.50	6.31	2.65	41.70	8.29

#### ROSLIN AREA

##### ROSLIN (1-1)

This occurrence is located 1800 feet upstream on the Plaster Creek from Route 21 at Roslin, located between Oxford and Pugwash. This dolomite is found in mounds trending N 65° W and standing 20 feet above the surrounding swampy land. The dolomite was quarried at one time but only on a small scale. There are several small ponds in the area which are probably sink holes. (See Figure 19, page 98)

#### Description

This is a brown, soft, slightly porous, medium-grained, fossiliferous, Windsor dolomite belonging to the B Subzone (Bell). The bedding is well developed with a light brown and smooth weathered surface. The dolomite is very fossiliferous containing brachiopods (most abundant), pelecypods and nautiloids. It also contains some cigar-shaped objects which may be filled in worm burrows. These are long and straight and do not appear to have any internal or external structure. The dolomite strikes N 80° W and dips 71° SW.

The dolomite would not appear to be greater than 20 feet thick with very little overburden. The mounds can be traced for a distance of 300 feet. There is no indication as to what is underlying or overlying the limestone although gypsum is found in this area. There are numerous sink holes up the brook from the outcrops.

The surrounding area is wooded and swampy.



Plate 49. Extremely fossiliferous Windsor dolomite found on the Plaster Brook which is 5 miles northeast of Oxford, Cumberland County. (Ro-1-1)

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Ro-1-1	39.70	11.45	8.15	26.50	14.20

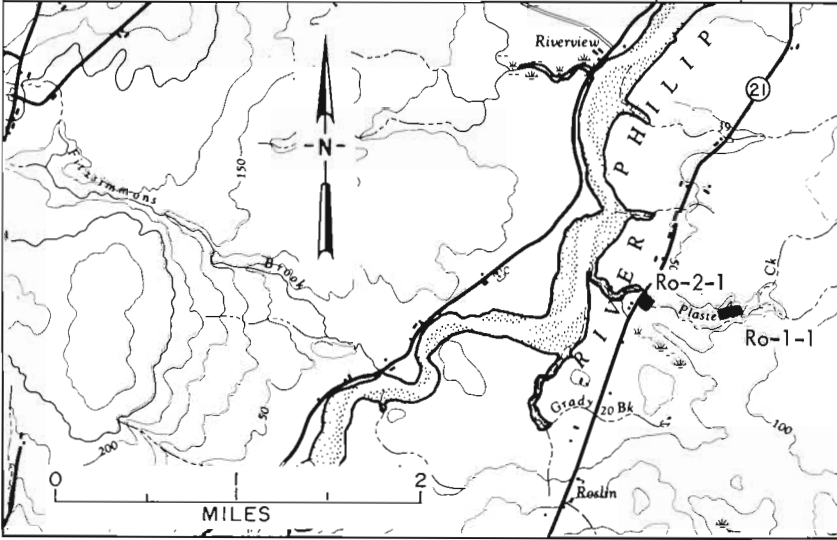
#### ROSLIN (2-1)

This occurrence of dolomite is located 50 feet south of the bridge on the Oxford-Pugwash Highway at Plaster Creek. The dolomite can be found outcropping in a mound on the south side of Plaster Creek and is probably a continuation of Ro-1-1. (See Figure 19, page 98)

#### Description

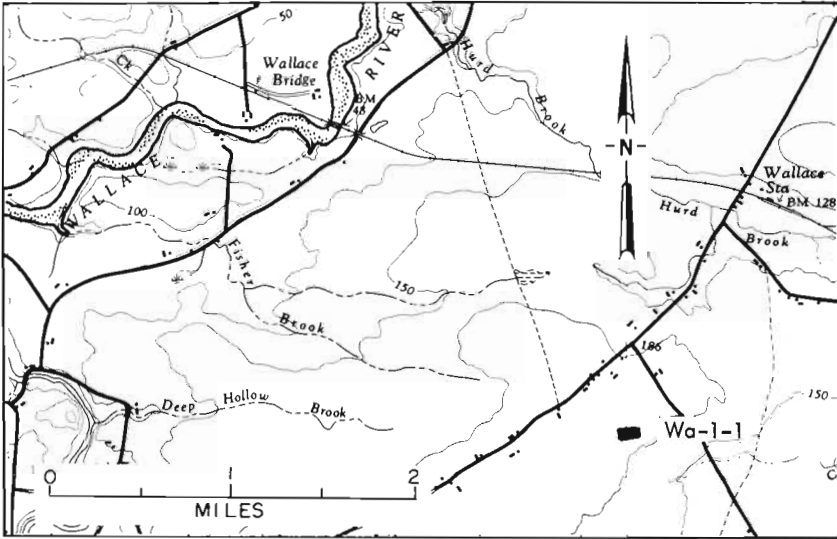
This is a dark brown, massive, hard, slightly porous, medium-grained, Windsor dolomite. The bedding is massive and very poorly developed with a dark brown, rough weathered surface. This dolomite appears to be striking in the same direction as Ro-1-1. This dolomite is less fossiliferous and contains a higher magnesium oxide value than Ro-1-1. The dolomite strikes N 40° W and dips approximately 80° NE.

The limestone is at least 12 feet thick with very little overburden. The dolomite appears to strike across the road but does not outcrop on the west side of the road, although there are numerous sink holes.



Ref. Map II-E-13-W

Figure 19



Ref Maps II-E-13-E, II-E-14-W

Figure 20

The surrounding area is mainly open farmland containing some sink holes.

This is a channel sample taken across the 12 feet of dolomite that is exposed.

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Ro-2-1	45.75	2.21	2.39	29.65	19.85

#### WALLACE AREA

#### WALLACE (1-1)

This occurrence is located on the south side of the road running from Wallace to Wentworth. The limestone is found in a small quarry 0.4 miles south of the old schoolhouse which is 1.3 miles southwest of Wallace Station. The limestone is found as rubble in an old quarry, but cannot be seen outcropping. It apparently had been worked in the early part of the 20th century. (See Figure 20, page 98)

#### Description

It is a light grey, very hard, compact, fine-grained, Windsor limestone. The weathered surface is yellowish brown and smooth. There is no visible outcrop in the area. The strike and dip could not be determined, but from information obtained from residents of the area and from old reports (Goudge, 1934), the limestone would appear to be flat lying and covering a wide area.

The thickness of the limestone could not be determined. The overburden would be between 5 and 10 feet thick (information obtained from farmers who drilled wells in the area).

The surrounding area is flat and heavily wooded. The quarry can be reached by an old logging road which is now impassable to vehicle traffic.

#### Analysis

Sample	L.O.I.(%)	SiO <sub>2</sub> (%)	R <sub>2</sub> O <sub>3</sub> (%)	CaO(%)	MgO(%)
Wa-1-1	40.60	5.01	1.51	51.75	0.53