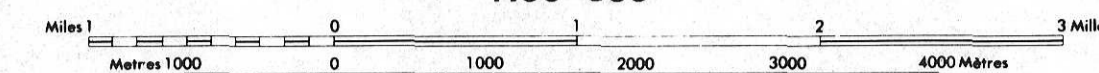


# SURFICIAL GEOLOGY OF THE MAYNE ISLAND AREA

NTS 92B/14

Geology by N.W. Rutter and H.E. Blyth

1:50 000



For an overview of the surficial geology of the Mayne Island map area please refer to the report entitled "Surficial Geology of Southern Vancouver Island and Gulf Islands" by H.E. Blyth and N.W. Rutter in Geological Fieldwork 1992, B.C. Ministry of Energy, Mines and Petroleum Resources, Paper 1993-1. Geology based on air photo interpretation followed by ground verification. Fieldwork completed in 1992. Any revisions or additional geological information would be welcomed by the authors.

### TERRAIN UNIT LETTER NOTATION

Surface material	Surface expression
Composite units	
Cv Mb	The component (Cv) above the symbol stratigraphically overlies the one below (Mb)
Mb/R	The component (Mb) to the right of the symbol is more extensive than the one that follows (R)

### SURFICIAL MATERIALS

Symbol	Description	ON-SITE SYMBOLS
C colluvium	Deposition with variable structure and texture, including talus, sandstone, breccias, debris flow and other mass-transport products and weathered bedrock.	Circle, only aerial (see the direction inferred, unknown)
F fluvial	Gravel, sand or silt deposited by streams and rivers; includes floodplain, river terraces, dikes and ditches for drainage.	Circle, groove (see flow direction inferred, unknown, older, younger)
gl glacioluvial	Fluvial sediment deposited in association with glacial ice; generally consists of gravel and silt; includes lateral outwash, fans, terraces and eskers.	Ice flow indicators (see flow direction inferred, unknown)
l lacustrine	Sediment deposited in lakes or ground lake channels; generally consists of sand, silt and clay; includes basal beds and lacustrine terraces.	Moraine ridge
lg glaciolacustrine	Lacustrine sediment deposited in association with glacial ice; similar to lacustrine deposits but displays features such as stony structures, low relief terraces and hummocks.	Eskar (flow direction known, unknown)
M moraine	Deposition (fill) deposited directly by glaciers; generally consists of well-compacted material with variable structure and texture; includes moraine, 18 plain and drumlin beltforms.	Meltwater channel
O organic	Material resulting from the accumulation and decay of vegetative matter; generally consists of peat; includes bogs, swamps and marshes.	Escarpment
R terrace	Outcrops and colluvium by less than 10 m of unconformable material.	Cirque
sb beach	Sediment deposited in marine waters or along coastline; generally consists of clay, silt, sand or gravel; includes beaches and deeper water deposits.	Cirque pit, mine or quarry
sg glaciomarine	Sediment deposited in a marine environment in close proximity to glacial ice; generally poorly sorted and matrix or massive; includes glaciomarine deltas and deeper water deposits.	Strandline
		Landslide (headscarp scarp)
		Field station
		Stop site

### SURFACE EXPRESSION

Symbol	Description	TEXTURES	GEOLOGICAL BOUNDARIES	
b	barrier (> 1 metre)	c	clay	Definite
f	fen	s	silt	Approximate
h	hummocky	s	sand	
p	plain	s	sand	
r	ridged	g	gravel - gravel to pebble	
s	steep slope (>30°)	k	cobble	
t	terrace	b	boulder	
v	veneer (< 1 metre)	d	diamicton	

### QUATERNARY HISTORY

The Quaternary history of southeastern Vancouver Island involves the interactive growth and decay of the Vancouver Island and Cordilleran ice sheets which resulted in deposition of thick sequences of glacial and interglacial deposits. Excluding the sediments of the last glaciation (Vashon till) most of the deposits have been eroded by subsequent glacial events, however, in some protected valleys and coastal lowlands extensive stratigraphic sequences have been preserved. These sequences reveal a history of up to three glacial and three interglacial events.

The oldest record can be found at Muir Point, in Sooke. This section contains material interpreted to be a pre-Sangamon (>125 000 years B.P.) glacial event originating from the northwest yet containing lithologies that indicate Cordilleran ice influence from the northeast. Unconformably overlying these sediments, is a succession of partly fossiliferous, nonglacial fluvial sediment interpreted to be Sangamon age (<125 000 years B.P.) which form the Muir Point Formation (Hickox and Armstrong, 1983).

Directly overlying the Muir Point Formation and underlying the nonglacial Cowichan Head formation is the Early to Mid-Wisconsinan Deeswood Formation. This unit, which was first formalized by Fyles (1963) near Qualicum Beach, B.C., is a till with associated lenses of clay, silt, sand and gravel. It is found in contact with underlying Maplegard sediments (Muir Point equivalent) and overlying Quadra sediments (the nonglacial Cowichan Head Formation equivalent, Clague, 1977).

The Mid-Wisconsinan (<65 000 - 29 000 years B.P.) nonglacial sediments of the Cowichan Head Formation vary from a lower marine, clay, silt member to an upper estuarine and fluvial member rich in organics and indicative of a climate that was a little cooler but quite similar to the present (Armstrong and Clague, 1977).

Following the deposition of the nonglacial Cowichan Head Formation climatic cooling resulted in the onset of the Fraser Glaciation approximately 29 000 years ago (Howes and Nasimith, 1983). Advancing ice from the alpine areas of the Coast and Vancouver Island Mountains made its way through the Strait of Georgia and deposited proglacial outwash termed the Quadra Sand (Clague, 1976 and 1977). The Quadra sand was deposited in the Victoria area no earlier than 22 600 +/- 300 years B.P. (Alley, 1979; Clague, 1977) and is best exposed at Cordova Bay, Cowichan Head, James and Sidney Island and at the base of the Trio gravel pit. The deposition of the Quadra sands was followed by the deposition of proglacial sands and gravels from both the Vancouver Island (mainly Cowichan valley) and the Cordilleran ice sheets. As these ice sheets built up in the Georgia depression they split into two lobes; one flowed south towards the Puget lowlands and the other flowed westward towards the continental shelf. The deposition of Vashon till from the Fraser Glaciation did not occur in the Victoria area until after 17 000 years ago (Howes and Nasimith, 1983) and it reached its maximum thickness of approximately 1500 metres in the Victoria area about 15 000 years ago (Clague et al., 1980).

The southern Vancouver Island area was free of Vashon ice by approximately 13 000 years ago (Alley and Chawin, 1979) but around 12 000 years ago a minor resurgence of ice produced ice dammed lakes in many of the major coastal valleys on southern Vancouver Island; for example the upper Cowichan Valley and the Pary Bay area. Glaciomarine silts deposited in the Victoria area have been dated at 12 100 +/- 160 years B.P. (Nasimith, 1971). In addition to the silts, the upper limit of the Cowichan delta (the modern Matchcoos/Cowood area) shows that isotopic depression and marine inundation, just after deglaciation on southeastern Vancouver Island, was approximately 75 metres above the modern sea level (Mathews et al., 1970). The deposits formed at this time are part of the Capilano post-glacial Late Wisconsinan and Early Holocene (<13 000 to 5000 years B.P.) age and include the silty diamicton locally known as the Victoria clay.

Sea level, which had been much higher than at present as a result of isostatic depression, eventually reached its present elevation approximately 700 years ago. These transgressions left behind numerous wave cut platforms and raised beaches throughout the Gulf Islands and southern Vancouver Island. However, between 9 250 and 5 000 years ago sea level dropped to more than 4 metres below present (Clague et al., 1980).

### SURFICIAL GEOLOGY

**Colluvium:** The Gulf Islands were completely covered by ice, at least during the last glaciation. The rugged topography, consists mostly of northwest trending ridges and valleys, with relief up to about 300 metres. The steeper upland areas either expose bedrock (R) or are covered by a thin veneer of colluvium (Cv over R) composed mostly of reworked till and local bedrock.

**Diamicton:** A variety of deposits are found on gentler slopes and low lying areas along the coast or within valleys. Glacial diamicton (dMb) commonly in the order of one to two metres thick, is found throughout the area. This diamicton is usually silty, indurated, grey to dark greyish brown and contains well stratified clasts (<4 cm) up to 30 per cent by volume.

**Sand and Gravel:** Relatively extensive deposits of coarse glacioluvial sand and gravel (sgF<sup>g</sup>) can be found in valleys and on valley sides up to about 100 metres in elevation on Saturna and Galiano Islands. Gravelly, well developed beach deposits about 0.5 metres thick are found overlying diamicton which in turn overlies bedrock three to five metres above the modern upper beach line at Bennett Bay on Mayne Island.

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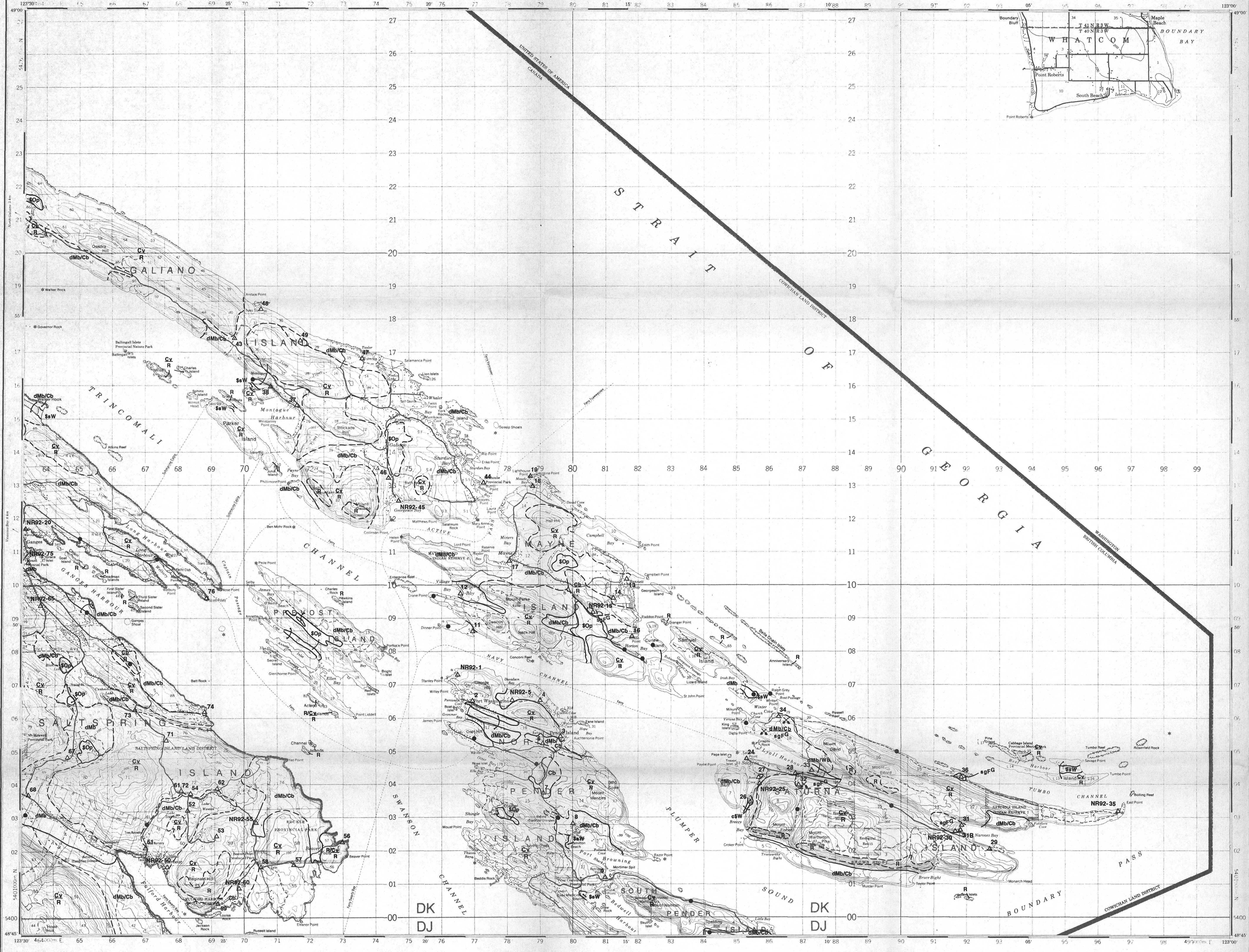
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**MAYNE ISLAND**  
CANADA-UNITED STATES OF AMERICA

Scale 1:50 000 Echelle

CONVERSION SCALE FOR ELEVATIONS  
Metres 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200  
Feet 100 130 160 190 220 250 280 310 340 370 400 430 460 490 520 550 580 610 640 670 700

CONTOUR INTERVAL: 20 METRES IN CANADA  
Elevations in metres above Mean Sea Level  
CONTOUR INTERVAL: 100 FEET IN U.S.A.  
North American Datum 1983

CONTOUR INTERVAL: 20 METRES IN CANADA  
Elevations in metres above Mean Sea Level  
CONTOUR INTERVAL: 100 FEET IN U.S.A.  
North American Datum 1983  
Population: Vancouver 600 000

Information concerning location and precise elevation of bench marks can be obtained by referring to the Bench Mark Survey and Mapping Branch Office.

De plus, obtenir des renseignements sur la liste d'altitude exacte des points de levés et sur les coordonnées des points de levés en se référant au Service de Levés et de Cartographie.

Échelle par le DIRECTION DES LEVÉS ET DE LA CARTOGRAPHIE, MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES EN MINÉRAUX.

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