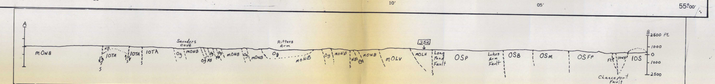
POINT LEAMINGTON

NEWFOUNDLAND

GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

Scale: One Inch to One Mile / 63,360

SHEET 2E



LEGEND - Point Leamington Map-Area

JURASSIC

Jb — BUDGELL'S HARBOUR GABBRO: Medium to coarse-grained analcite gabbro, hornblende gabbro, hornblende pyroxenite, biotite gabbro, and associated lamprophyre dykes.

DEVONIAN

Dlg — LONG ISLAND granodiorite batholith: Light grey, medium to coarse-grained, hornblende-biotite granodiorite; fine-grained biotite granite; pink fine grained rhyolite porphyry.

SILURIAN

Sb — Medium- to fine-grained gabbro and diabase sills (intrude Cottrells Cove Group)

Slw — BOTWOOD GROUP (Slw)
WIGWAM FORMATION: red to brown and grey to green micaceous sandstone, siltstone and quartzite

ORDOVICIAN AND SILURIAN
UPPER ORDOVICIAN AND LOWER SILURIAN
COTTRELLS COVE GROUP (OSf, Osp, OSs)

OSf — FORTUNE HARBOUR FORMATION: Volcanic and sedimentary rocks; p, green to red pillow lava and pillow breccia with interstitial chert and limestone; t, coarse- to fine-grained acidic pyroclastic rocks, bedded tuff, red to green chert and rhyolite flows

OSH — MOORES COVE FORMATION: tuffaceous sandstone, slate, argillite, grey-wacke, thin lava flows, and red chert

OSB — BOONES POINT COMPLEX: chaotically slumped black and grey argillite, pillow lava, mafic volcanic flows, tuff, limestone, conglomerate and chert

Slg — GOLOGON FORMATION: coarse, grey to red polymictic conglomerate, grey sandstone and quartzite.
Slgb - greywacke lentils within conglomerate.

OSs — SANSON GREYWACKE: medium grey, well-bedded, graded greywacke, commonly chaotically slumped; local conglomeratic horizons near top and bottom of the formation.

EXPLOITS GROUP (IOTA, mOmb, mOLv, mOLH, Op, OSP)

OSP — POINT LEAMINGTON GREYWACKE: medium grey to black, thinly bedded greywacke and silty argillite, commonly chaotically slumped;
OSPc - conglomerate lentils within greywacke.

ORDOVICIAN
MIDDLE AND UPPER ORDOVICIAN (CARADOCIAN)

Op — Black carbonaceous argillite and argillaceous siltstone; locally chert at base

mOLH — LAWRENCE HARBOUR SHALE: Black cherty argillite, shale, laminated chert and siliceous tuff.

LOWER AND MIDDLE ORDOVICIAN

mOLv — LAWRENCE HEAD VOLCANICS: dark green mafic pillow lava, mafic agglomerate and tuff, and columnar basalt.

mONB — NEW BAY FORMATION: Buff weathering graded sandstones and conglomeratic turbidites; dark grey silty shales; thinly bedded and laminated red and green cherty argillite and cherty tuff; local quartz wacke greywacke and conglomerate

IOTA — TEA ARM VOLCANICS: Dark brown to dark green pillow lava, pillow breccia, vesicular basalt flows, and mafic agglomerate; minor red, green and black chert and siliceic tuff.

ORDOVICIAN AND SILURIAN

OSFOp — FROZEN OCEAN GROUP: Dominantly dark green mafic pillow lavas.

MIDDLE AND LOWER ORDOVICIAN

mOsa — SHOAL ARM FORMATION: Red to green and black chert; black carbonaceous argillite and argillaceous siltstone; minor siliceous tuff.

Og — Fine to coarse-grained, porphyritic to non-porphyritic gabbro and diabase sills. Intrude Wild Bight Group and Point Leamington Group.

OLu — LEADING TICKLES STOCK: Sheared serpentinized peridotite; medium grained gabbro and diabase.

OSL — SOUTH LAKE IGNEOUS COMPLEX: Coarse to medium-grained hornblende tonalite, hornblende diorite, trondhjemite, granodiorite and gabbro (some phases) intrude Wild Bight Group)

WILD BIGHT GROUP

mOP — PENNY'S BROOK FORMATION (mOPs, mOPp, mOPa)

mOPt — Red and green thin bedded tuff; green, thick-bedded lapilli tuff; tuffaceous sandstone, greywacke and chert.

mOPp — Pillow lava, pillow breccia, mafic flows and agglomerate.

mOPa — Acidic pyroclastic and flow rocks.

CAMBRIAN OR LOWER ORDOVICIAN

COSL — SOUTH LAKE OPHIOLITE: Amphibolitized layered gabbros and sheeted diabase intruded by trondhjemite

Mineral Occurrences, Prospects and Mines

1. South Lake #1: Chalcopyrite stringers in sheeted diabase of the South Lake Ophiolite.
2. Little North Harbour: Disseminated and semi-massive pyrite and chalcopyrite in chloritic altered basalt.
3. Strong Island: Disseminated pyrite in mafic volcanics.
4. Strong Island: Disseminated pyrite in mafic tuff and agglomerate with local malachite staining.
5. & 6. Strong Island Sound: Disseminated pyrite in mafic volcanics.
7. Tea Arm: Irregularly disseminated pyrite with minor chalcopyrite and sphalerite in a thin acidic pyroclastic unit within mafic volcanics and associated cherts.
8. Saunder's Cove: Small sulphide pods and stringers in altered mafic volcanics and in calcite-epidote veins cutting the volcanics.
9. Lock Port Mine: Massive pyritic sulphide body with low copper values and local sphalerite rich zones in acidic volcanic rocks and associated chert.
10. Four Mile Pond: Disseminated and stringers of pyrite in chloritized mafic volcanics.
11. Big Rico Pond Area: Disseminated pyrite throughout acidic volcanic rocks over an extensive area.
12. South Lake #2: Veinlets of pyrite, chalcopyrite and boronite in hornblende diorite and in quartz veins intruding diorite.
13. Grassy North: Disseminated pyrite with minor chalcopyrite in quartz diorite/contact with tuffs.
14. Cully's Pond: Disseminated and stringers of pyrite and chalcopyrite in altered basalt.
15. Runnocky Island: Lenses of limestone up to 15 ft wide in chloritic mafic volcanics and greywackes.
16. Pond Island: Blebs, crystals and stringers of pyrite and sphalerite with minor chalcopyrite, tetrahedrite and bismuthinite in narrow quartz veins in an intrusive rhyolitic phase of the Lond Island Pluton.
17. Budgell's Harbour: Disseminated pyrite with local malachite staining in the Budgell Harbour Gabbro.

Geological boundary (defined, approximate and assumed)
Bedding, tops known (horizontal, inclined, vertical, overturned)
Bedding, tops unknown (inclined, vertical)
Dyke trend (inclined, vertical)
Schistosity, gneissosity, cleavage, foliation (horizontal, inclined, vertical)
Fault (defined, approximate, assumed)
Anticline (upright, overturned)
Syncline (upright, overturned)
Fossil locality
Mineral occurrence
Mineral prospect, test pit or trench
Shaft or quarry (exploration, abandoned production, in production)
Adit or tunnel

CAMBRIAN AND/OR ORDOVICIAN

COd — DUNNAGE MELANGE: Black to green and black chaotic argillite and pebbly to cobbly mudstone with exotic blocks and boulders of pillow lava, greywacke, bedded clastic rocks, agglomerate, gabbro, limestone and granites; v, large volcanic masses in shaly melange

Explanatory Notes - Point Leamington Map-Area

The oldest rocks of the map-area are the layered gabbros and diabase dykes of the South Lake Ophiolite. These gabbros and dykes are generally amphibolitized but are otherwise identical to other Cambro-Ordovician ophiolitic rocks from elsewhere in the Central Mobile Belt (Upadhyay et al., 1971; Strong, 1973; Norman and Strong, 1975). Other phases of the South Lake Igneous Complex, which is in part intrusive into the Cambro-Ordovician(?) basalts, may also be ophiolitic. Volcanic rocks of the Moretons Harbour Group, exposed north of the Chanceport Fault, are considered to be Cambro-Ordovician in age. The Moretons Harbour Group is best exposed in the Moretons Harbour - Twillingate area to the east (2E/10). The basal unit of the Group in that area is the Sleepy Cove Formation which is oceanic tholeiite like the Lushs Bight Group to the west(2E/12; 12H/9). By lithologic and stratigraphic similarity with the Western Arm and Cutwell Groups (2E/12), the Moretons Harbour Group is Lower Ordovician in age and overlies Chanceport Fault. Because it is separated from the Moretons Harbour area (Strong and Payne 1973), its island arc tholeiite chemistry and the abundance of diabase dykes, the Moretons Harbour Group probably represents the core of a volcanic island arc built on oceanic crust.

In the map-area, the lower unit of the Moretons Harbour Group, the Sweeny Island Terrane, is dominated by numerous dykes which act as feeders to the pillow lavas of the overlying Western Head Formation. The contact between the two units is transitional over 10 m and the lowermost pillow lavas of the Western Head Formation often have thin lenses of red chert and associated sulphide showings.

South of the Chanceport Fault, Ordovician rocks of pre-Caradocian age are exposed in three distinct areas: (1) the Wild Bight Group in the west, (2) the lower half of the Exploits Group in the centre, and (3) the Dunnage Mélange in the east.

Only the uppermost formation of the Wild Bight Group, the Penny's Brook Formation, is exposed in the map-area. The full sequence of the group is exposed in the Robert's Arm map-area (2E/5) to the west. The volcanic and volcanogenic sedimentary rocks of the Wild Bight Group represent a Lower to Middle Ordovician island arc sequence which overlies oceanic crust, represented in the map-area by the South Lake ophiolite.

The lowermost unit of the Exploits Group (Helwig, 1969) is the Tea Arm Volcanics. This unit of dominantly mafic volcanics can be correlated with the Lower Ordovician of the Wild Bight Group which underlie the Penny's Brook Formation to the west (2E/5). The Tea Arm volcanics is overlain by dominantly sedimentary rocks of the New Bay Formation. The New Bay Formation is equivalent to the unit previously named the Saunders Cove Formation (Helwig, 1969) are presently included in the New Bay Formation since similar lithologies occur throughout the New Bay Formation, and the Saunders Cove Formation is not lithologically distinct and the name is abandoned.

Although the New Bay Formation consists dominantly of graded sandstones and conglomeratic turbidites, tuff, tuffaceous sandstone and argillite are very common. These volcanogenic sedimentary rocks are identical to lithologies of the Penny's Brook Formation to the east. The New Bay Formation then probably represents a more distal sedimentary facies to the volcanic and volcanogenic sedimentary rocks of the Penny's Brook Formation. The New Bay Formation is overlain conformably by pillow lavas and breccias of the Lawrence Head Volcanics. These mafic pillow lavas and flows can be correlated stratigraphically and lithologically with the flow lavas at the top of the Penny's Brook Formation west of Point Leamington.

The New Bay Formation in part underlies and transitionally grades eastward into the chaotic Mélange (Williams and Hibbard, 1976). The Lawrence Head Volcanics occur as large blocks in the mélange indicating a mid-Ordovician age for the formation of the mélange in the map-area even though it contains Cambrian fossils to the east (Kay and Eldredge, 1968).

Pre-Caradocian units south of the Chanceport Fault are intruded by igneous rocks which do not intrude younger rocks and are believed to be Ordovician in age. The South Lake Igneous Complex, which is dominantly fault-bounded, locally intrudes the Wild Bight Group, although some phases are clearly ophiolitic and older than the Wild Bight Group. The Wild Bight Group, the lower half of the Exploits Group and the Dunnage Mélange are intruded by gabbro sills which predate the formation of the Dunnage Mélange (Hibbard, 1976).

Lower to Middle Ordovician rocks south of the Chanceport Fault are overlain by carbonaceous black argillites of Caradocian age. The Penny's Brook Formation of the Wild Bight Group is overlain conformably by the Shoal Arm Formation consisting of black argillite with red and black chert near the base. Graptolites from the Shoal Arm Formation range the entire span of the Caradocian.

The Lawrence Head Volcanics of the Exploits Group is overlain by the Lawrence Harbour Shale, redefined by Helwig (1969) to be restricted to shales containing the Nemagraptus gracilius (Salter) faunal assemblage. Younger Caradocian shales of the Exploits Group, included in the Lawrence Harbour Shales by Heyl (1936), are apparently faulted against the Lawrence Harbour (Helwig 1969) at Lawrence Harbour. These shales are correlatives of the younger parts of the Shoal Arm Formation and are designated Oco on the map. Caradocian shales of the Dark Hole Formation apparently overlie the Dunnage Mélange to the east (Williams and Hibbard, 1976).

Southwest of Point Leamington, the Shoal Arm Formation is apparently conformably overlain by mafic pillow lavas. These lavas are in an analogous stratigraphic position as mafic pillow lavas of the Frozen Ocean Group which overlie the Shoal Arm Formation in the Lewis Lake Area to the west (2E/5). For this reason these lavas are also included in the Frozen Ocean Group.

With the exception of the above-mentioned pillow lavas, the Caradocian argillites are everywhere overlain by a thick sequence of greywacke of Upper Ordovician to Silurian age. The greywacke is known as the Point Leamington Greywacke in the New Bay area (Helwig, 1969) and the Sansom Greywacke in Bay of Exploits. A large lentil of polymictic conglomerate appears within the greywacke between Point Leamington and West Arm. The Point Leamington and Sansom Greywackes are both overlain conformably and gradationally by coarse conglomerate of the Goldson Formation of Lower Silurian age. The Goldson Formation also includes greywacke lentils in the New Bay area, indicating that there is no major break in the type of sedimentation at the Sansom-Goldson boundary.

On the Fortune Harbour Peninsula, the Point Leamington Greywacke is overlain by the Cottrells Cove Group of probable Silurian-age (Dean 1973). The base of the Cottrells Cove Group is a complex sedimentary-volcanic mélange known as the Boones Point Complex. The Boones Point Complex was interpreted by Helwig (1967) as a tectonic mélange in the Lukes Arm Fault zone and redefined the Lukes Arm Fault as the base of the mélange. The Boones Point Complex is best regarded as a stratigraphic unit - a complex slump mélange that possibly marks the beginning of Cottrells Cove Group volcanism. Large blocks of Goldson-type conglomerate are common and a fault-bounded wedge of volcanic-limestone mélange on upper Black Island, tentatively included in the Boones Point Complex, contains Silurian fossils (Boucot 1969). The Boones Point Complex can be correlated with the Sops Head Complex at the base of the Roberts Arm Group to the west (2E/5). The Boones Point Complex is overlain conformably by sedimentary rocks of the Moores Cove Formation. Red cherts-slates and tuffs of the upper part of the formation can be correlated with the Crescent Lake Formation of the Roberts Arm Group to the west (2E/5). The Moores Cove Formation is conformably overlain by dominantly volcanic rocks of the Fortune Harbour Formation. The top of the Fortune Harbour Formation is faulted against the Lower Ordovician Moretons Harbour Group along the Chanceport Fault.

Gabbro and diabase sills, possibly contemporaneous with volcanism, intrude the Fortune Harbour Formation.

South of the Northern Arm Fault, near Lewisporte, Silurian red sandstones of the Wigwam Formation of the Botwood Group are exposed on the coast and islands of Burnt Bay in fault contact with the Dunnage Mélange.

The Long Island granitic batholith of Devonian age intrudes Ordovician and Silurian rocks post-tectonically. The youngest rocks in the map-area are Jurassic-Cretaceous lamprophyre dykes and the Budgells Harbour Gabbro which has a K-Ar date of 155 ± 7 m.y. (Strong and Harris, 1974); this alkalic igneous event heralds the opening of the present Atlantic Ocean (Helwig et al., 1974).

Segments of two major faults, the Chanceport Fault and the Northern Arm Fault, are exposed in the map-area. The Chanceport Fault, in the north, juxtaposes the Moretons Harbour Group against Botwood Group and probable Silurian rocks of the Cottrells Cove Group. It is the continuation of the Lobster Cove Fault to the west (2E/12) and is the major fault of northern Notre Dame. This major fault always separates Lower Ordovician volcanic rocks on the north from north-facing Upper Ordovician-Silurian volcanic rocks to the south. It is presently interpreted as an early Acadian thrust fault with more than 10 m of Group having been thrust from the northwest upon the Cottrells Cove Group. The thrust fault was subsequently stepened by later Acadian folding. The anticline at Little North Harbour is asymmetrical with a steeply overturned south limb. This structure was probably a nappe-like feature related to thrusting.

Acadian folds are dominantly northeast-trending and northeast-plunging, typical of Acadian structures. However, in the southwest part of the map-area, fold axes trend northwest and plunge southeast. This area is on the east limb of a major southeast-plunging anticline. North of the Long Pond Fault on the Fortune Harbour Peninsula, Acadian folds are east-trending and east-plunging, parallel to the Chanceport Fault.

The Northern Arm Fault, in the southeast corner of the area, is a continuation of the Reach Fault to the northeast (2E/7, 2E/10). It post-dates the main phase of Acadian folding and granitic intrusion and is possibly a major transcurrent fault. Other northeast-trending faults such as those in the southeast corner of the map-area are probably related to the later phase of folding. Silurian red sandstones and subaerial volcanics of the Botwood Group are the only southeast of the Reach-Northern Arm fault system which marks the boundary between the Exploits and Botwood zones in the central Newfoundland Appalachians (Williams et al., 1972).

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