



GEOLOGY OF THE DASHWOODS POND AND PART OF ST FINTAN'S MAP AREAS, SOUTHWEST NEWFOUNDLAND

12 B/1-2

Scale 1:50 000 - Échelle 1/50 000 Kilometres 1 0 1 2 3 4 Kilomètres Universal Transverse Mercator Projection Projection transverse universelle de Mercator © Droits de la Couronne réservés © Crown Copyrights reserved

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DESCRIPTIVE NOTES

INTRODUCTION The Trans Canada Highway (Route 1) and some privately owned logging roads provide access to portions of the western and northern part of the map areas. The greater portion of the map areas is easily

accessible only by aircraft. The topography is dominated by the Long Range uplands, a gently rolling surface with an elevation between 300 and 650 meters, which is deeply dissected by rivers and streams. Much of the map areas does not support forest cover above an elevation of 300 to 350 meters, except a more or less dense growth of stunted spruce ("tuckamore") and is characterized by bogs between barren peaks and ridges. The degree of bedrock exposure is high in the barren uplands, although exposure in areas underlain by granite is restricted to the top of large rounded hills. Except in streams, exposure is poor to non-existent in the wooded valleys. Large portions in the south of the Dashwoods Pond map area (12B/1) are covered by bouldery till. All

of the map areas have been glaciated, with ice movements dominantly to the northwest. The map areas were previously covered by 1:250 000 reconnaissance mapping (Riley, 1962). In the 1985 field season most of the present map areas and the adjacent map areas to the east, northeast and north were mapped on a 1:100 000 scale (Van Berkel et al., 1986; Van Berkel and Currie, 1986). During the 1986 field season parts of the map areas were covered on a 1:50 000 scale and key areas were studied in more detail. Mapping on a 1:50 000 scale of the adjacent northern Main Gut (12B/8) map area was also done in the 1986 field season (see Van Berkel, 1987a) and is published as a separate open file report (Van Berkel, 1987b). The adjacent eastern area (King George IV, 12A/4) was mapped on a 1:50 000 scale by Kean (1983). The Carboniferous rocks of the Bay St. George Subbasin (units C1 and C2) are described by Knight (1983) and the reader is referred to this memoir for a detailed description.

The Long Range Fault divides the pre-Carboniferous rocks into two contrasting terranes. The western terrane (Humber Zone of Williams, 1979) consists of a Grenvillian basement with a late Proterozoic to early Paleozoic sedimentary cover, locally veneered by easterly derived early Paleozoic ophiolitic allochthons. The eastern terrane consists of felsic to mafic volcanics, clastic sediments and ophiolitic rocks, all cut by granite and granodiorite ranging in age from Ordovician to Devonian. This eastern terrane is part of Williams' (1979) Dunnage Zone. Along the entire length of the Long Range Fault granitic to intermediate gneisses (unit P2) form a continuous strip of Grenville basement(?) across the Main Gut, Dashwoods Pond and St. Fintan's map areas. The gneisses (unit P2) continue southwestwards into the Grandys Lake area (110/15; see Chorlton, 1983).

The dominant rock type northwest of the Long Range Fault is anorthosite (Steel Mountain anorthosite, unit P1) which contains minor facies of norite and meta quartz-diorite to tonalite. Carboniferous sedimentary rocks (units C1 and C2; Knight, 1983) are in fault contact with the anorthositic rocks (unit P1) and intermediate to granitic gneisses (unit P2).

Southeast of the Long Range Fault, medium to high-grade metamorphic, generally leucocratic quartzofeldspathic rocks of the Cormacks Lake Complex (unit PCI; Herd and Dunning, 1979) and psammitic, pelitic and quartzitic metasediments (unit PE2) are invaded by syntectonic biotite granite (unit 02). They are all intruded by large late-tectonic plutons of granite (units 05a and 05b) and granodiorite (unit 05c), and smaller post-tectonic plutons of biotite leucogranite (unit 06). The metasediments (unit PC2) contain numerous inclusions and strips of serpentinite and metamorphosed ultramafic rocks (unit Ola), and metagabbro (unit 01b). Well-preserved diabase (units 03 and 04) occurs in two different bodies which are also intruded by late-tectonic granite (unit 05) and post-tectonic granite (unit 06). Several, generally small bodies of post-tectonic diorite (unit 07) were found throughout the region.

DESCRIPTION OF ROCK UNITS

Chorlton, 1980).

Upper Proterozoic (Grenvillian) rocks Anorthositic rocks of the Steel Mountain complex (unit P1) terminate in the Dashwoods Pond (12B/1) map area. Much of the anorthosite has massive, partly recrystallized, medium grained (up to 10 cm long) feldspar and even larger (up to 3 m) pyroxene crystals. Pyroxene is altered to hornblende and may have a rim of biotite. Most anorthositic rocks (unit Pla) have colour indexes less than 5 but locally gabbroic anorthosite (CI = 10-30) and norite (CI = \pm 50) are present. Pockets of titaniferous magnetite are uncommon. Brittle faults and fracture zones are widespread. The Steel Mountain anorthosite is a massiftype anorthosite (Simmons and Hanson, 1978; Emslie, 1978) and can be correlated with the Grenvillian Indian Head anorthosite (Walthier, 1949; Heyl and Ronan, 1954; Colman-Sadd, 1974) located some 15 km to the

west, east of Stephenville. Intermediate and granitic gneisses (unit P2) containing inclusions and large bodies of amphibolite occur within and between the Long Range Fault zone and the Steel Mountain anorthosite. A low-grade metamorphic overprint often forms an incipient mica-rich foliation in these gneisses and the strike of the foliation is parellel to the trace of the Long Range Fault. Locally, spectacular platy schists are produced in shear zones. The intermediate and granitic gneisses (unit P2) are identical to the composite gneiss complex in the Harrys River map area (12B/9; see Currie, 1986, 1987), and are assumed to be Grenvillian on the basis of composition, structural style and high grade metamorphic textures. The age of the low-grade metamorphic overprint is probably late Proterozoic or early Paleozoic.

Late Upper Proterozoic to Cambrian rocks Across the Long Range Fault rock types change dramatically. The oldest rocks east of the Long Range Fault form two north-south trending belts, one with generally leucocratic quartzofeldspathic rocks (unit PCI) of unknown origin and one with metasedimentary rocks (unit PC2). The belts are separated by

late-tectonic granite and granodiorite (unit 05). Leucocratic quartzofeldspathic rocks of the Cormacks Lake Complex (unit PCI; Herd and Dunning, 1979) contain minor amounts of quartzitic to pelitic rocks and amphibolite. Locally gedrite which develops characteristic sheafs, is present. The leucocratic quartzofeldspathic rocks are common in large enclave zones within gneissic biotite granite (unit 02a), e.g. southeast of Portage Lake. Large bodies of amphibolite (unit PClb) are grouped with the Cormacks Lake Complex (unit PCl) but may represent metamorphosed equivalents of the ophiolitic rocks (unit 01). The unit (PCI) extends into the adjacent northern Main Gut (12B/8) map area, and to the south into the La Poile River map area (110/16;

The metasedimentary rocks (unit PE2) can be subdivided into a western portion dominated by psammitic sediments and a much smaller eastern portion of quartzitic and semipelitic sediments. All were deformed and metamorphosed during medium to high-grade metamorphism. The psammitic sediments (unit PC2a) exhibit a medium grained granoblastic texture with abundant feldspar porphyroblasts (Van Berkel et al., 1986, Fig. 19.5) that commonly obliterate primary sedimentary features. Amphibolite (unit PE2c) inclusions are common and locally large bodies of amphibolite are present but no recognizable ultramafic bodies were observed. Trains of amphibolite inclusions may be highly deformed and disrupted

Lithologically montonous quartzitic and semipelitic metasediments (unit P@b) form a narrow zone along the eastern edge of the metasedimentary belt (unit PE2), have undergone severe deformation, and contain strips and inclusions of tectonized serpentinized dunite and other metamorphosed ultramafic rocks (unit 01a), and gabbro (unit 01b). Microstructural evidence for strong deformation is obliterated by recrystallization but numerous foliation-parallel quartz veins and lenses (Van Berkel, 1987a, Fig. 41.3) are preserved in certain zones and probably formed in shear zones by tectonic segregation (Piasecki, 1980; Temperley, in press). The origin of the ultramafic slivers is uncertain. They could mark the traces of major thrust faults (Van Berkel et al., 1986). Alternatively, severe deformation of a sedimentary ophiolitic mélange (cf. Williams, 1977) could give similar field relations. A detailed study of this unit (PCb) and the

Memorial University). The nature of the contact between the two metasedimentary units (P@a and b) is not well established, but appears to be a gradual change over a distance of a few hundred metres. The quartzitic and semipelitic metasediments (unit P€2b) may be medium to high metamorphic grad equivalents of the quartzite and pelitic schists around the southwest tip of Grand Lake in the Harrys River map area (12B/9; Currie, 1986, 1987) which have been correlated with the Fleur de Lys Supergroup (Knapp et al., 1979; Kennedy, 1981; Hibbard, 1983 a, b; Williams, 1985).

Mafic and ultramafic rocks of possible ophiolitic affinities (unit 01) not only occur in the metasediments (unit PE2) but also as enclaves in gneissic biotite granite (unit 02a). Metagabbro (unit 01b) is generally altered to amphibolite and variably epidotized, but locally, moderately strained, coarse grained original textures are preserved, e.g. south of Portage Lake (Van Berkel, 1987a, Fig. 41.4) and north of Cross Pond (Main Gut map area, 12B/8, see Van Berkel, 1987b). Dunite, harzburgite and pyroxenite (unit 01a) are well preserved in a large outcrop south of Portage Lake where moderately to highly strained metagabbro (unit 01b) encloses a large (300 by 200 m) tectonic sliver of partially serpentinized dunite, harzburgite and pyroxenite. From southeast to northwest dunite with minor harzburgite passes abruptly into pyroxenite veined by harzburgite. Other tectonic slivers enclosed by metagabbro (unit 01b) in this region contain harzburgite and pyroxenite. Small amounts of chromite are found as dispersed euhedral crystals in dunite, and also as thin seams in serpentinite inclusions and layers in the metasedimentary rocks (unit PE2; see

Van Berkel et al., 1986, Fig. 19.7) of the Main Gut map area (12B/8; see Van Berkel, 1987b). Syntectonic biotite granite (unit 02) invaded the quartzofeldspathic (unit PCI), metasedimentary (unit PE2) and ophiolitic rocks (unit 01). The field relations are well exposed around Cross Pond in the Main Gut map area (12B/8; see Van Berkel, 1987b). Quartzofeldspathic rocks (unit PCI) and complexly folded metagabbro (unit 01b) form enclaves within structurally less complex gneissic granite (unit 02a). Inclusions composed of fine grained biotite-plagioclase and amphibolite are also common around Cross Pond (Van Berkel, 1987a, Fig. 41.5). The fine-grained biotite-plagioclase rock appears to be metasomatised amphibolite. Some of the better preserved amphibolites in this exposure form recognizable dykes (Van Berkel, 1987a, Fig. 41.5), are less consumed by the granite and could represent synplutonic dykes. The gneissosity in the granite is best developed where the granite contains numerous enclaves. In many exposures away from the enclave zones a poorly foliated medium grained texture is visible. Close to the ultramafic ophiolitic rocks (unit 01a) of Portage Lake structural complexity increases in the gneissic granite (unit 02a) and xenoliths of the ophiolitic rocks are common (Van Berkel, 1987a, Fig. 41.6). Fine-grained biotite leucogranite (unit 02b) which rarely shows a gneissic banding is classified with the gneissic granite

Bodies with fine to medium grained mafic rocks (units 03 and 04) have been termed diabase complexes because they generally exhibit a well-preserved subophitic texture. East of Dashwoods Pond a large diabase complex (unit 03) contains rather leucocratic (CI = 40) medium grained rocks composed of plagioclase with minor orthopyroxene and even less hornblende. They are cut by more mafic dykes (CI = 60) which generally trend between northeast and southwest, and comprise between 5 to 30% of individual exposures. Besides plagioclase the mafic dykes have significant amounts of hornblende and minor orthopyroxene. Plagioclase and orthopyroxene crystals are locally seen to form fine-grained cumulus crystals surrounded by much coarser grained intercumulus of hornblende. The rocks generally have a weak metamorphic fabric and contain secondary actinolite, epidote and mica. Fine to medium grained diabase (unit 04) was found in a poorly exposed area 13 km south of Portage Lake. Boulder mapping suggests a fairly large body.

Late-tectonic, massive to weakly foliated plutons composed of a variety of granitic rocks (unit 05) invade the previously described rock units. Dominant rock types are medium grained biotite granite (unit 05a), porphyritic biotite granite (unit 05b) with K-feldspar crystals up to 3 cm long in a medium grained matrix, and medium to coarse grained hornblende-biotite granodiorite (unit 05c). The regional distribution of granite and granodiorite is confirmed by radio-element mapping techniques (Broome et al., in press). Rare mesocratic hornblende granodiorite and leucocratic granite with less than 1% biotite appear as

Medium grained, massive homogeneous biotite leucogranite (unit 06) occurs as one large and a number of small plutons and dykes in the eastern part of the map areas. Felsic porphyry dykes were also found in Small, massive diorite plutons (unit 07) occur throughout the map areas. Around Crabbes River the this region. diorite contains numerous mafic inclusions. These massive diorites are thought to be correlative with

Devonian and Carboniferous rocks A few exposures in the map area contain felsic to intermediate altered volcanic rocks thought to form part of the Windsor Point Group (unit D) which contains sedimentary and volcanic rocks (e.g. Kean, 1983). The age of the Windsor Point Group is uncertain. Kean (1983) and Chorlton (1983) consider the Windsor Point Group to be Devonian on the basis of fossils from grey sandstone but Chandler (1982) and Chandler and Dunning (1983) showed that the fossiliferous sandstone unconformably overlies a red bed - acid volcanic sequence which gave a tightly defined Silurian radiometric age (431 ± 5 Ma). Carboniferous sediments of the Bay St. George Subbasin (units C1 to C3) have been described in detail by Knight (1983) and were not mapped by the author. They are in fault contact with the Steel Mountain anorthosite (unit P1). Southwest of the Steel Mountain anorthosite they are separated from the strip of Grenvillian gneisses by the Long Range Fault. Here, they mainly consist of sandstone and conglomerate.

ECONOMIC GEOLOGY OF ULTRAMAFIC ROCKS

diorite-tonalite of the Southwest Brook Complex (Herd and Dunning, 1979).

Several rock samples of the ultramafic body (unit 01a) south of Portage Lake (Van Berkel, 1987a, Fig. 41.7) were analyzed for Au, Pd and Pt (Van Berkel, 1987a, Table 41.1). Pyroxenite in the northwestern portion of the ultramafic body contains numerous harzburgite veins and both harzburgite and pyroxenite (samples 6VM62-71) have relatively high values of Pd (up to 100 ppb) and Pt (up to 130 ppb) but no detectable Au (less than 1 ppb). Closer to the dunite-pyroxenite contact Au content increases for harzburgite (up to 12 ppb; samples 6VM72A and B, 6VM73 and 6VM74) but the Pd and Pt content decreases dramatically. A harzburgite pod (sample 6VM79) in the dunite portion (sample 6VM80) of the ultramafic body has similar low values.

Serpentine layers and inclusions (unit Ola) enclosed by the metasedimentary rocks (unit P€) locally contain up to 10 percent chromite and magnetite in the form of thin seams (Van Berkel et al., 1986, Fig. 7) or as dispersed euhedral crystals. Au-Pt-Pd analyses (Van Berkel et al., 1986, Table 1 and unpublished data) of various serpentinite layers (unit Ola) in the Dashwoods Pond (12B/1) and Main Gut (12B/8) map areas yield up to 40 ppb Au, up to 54 ppb Pt and up to 36 ppb Pd.

Broome, J., Carson, J.M., Grant, J.A. and Ford, K.L. 1987: A modified ternary radio-element mapping technique and its application to the south coast of Newfoundland; Geological Survey of Canada, Paper , in press.

1982: Sedimentology of two middle Paleozoic terrestrial sequences, King George IV Lake area, Newfoundland and some comments on regional paleoclimate; in Current Research, Part A, Geological Survey of Canada, Paper 82-1A, p. 213-219.

1980: Geology of the La Poile River area (110/16), Newfoundland; Newfoundland Department of Mines Chorlton, L. and Energy, Mineral Development Division, Report 80-3, 86 p. 1983: Geology of the Grandys Lake area (110/15), Newfoundland; Newfoundland Department of Mines and Energy, Mineral Development Division, Report 83-7, Part 1, 116 p.

1974: Iron deposits of the Indian Head Range; in Metallogeny and Plate Tectonics. A Guidebook to Newfoundland Mineral Deposits (edited by D.F. Strong). NATO Advanced Studies Institute, p. 150-158. 1986: Harrys River (12B/9E) and part of Little Grand Lake (12A/12) map areas, southern Long Range,

Newfoundland. Geological map (scale 1:50 000) with descriptive notes. Geological Survey of Canada, Open File Report 1406. 1987: A preliminary account of the geology of the Harrys River map area, southern Long Range of

Newfoundland. In: Current Research, Part A, Geological Survey of Canada, Paper 87-1a,

1978: Anorthosite massifs, rapakivi granites, and late Proterozoic rifting of North America. Precambrian Research, v. 7, p. 61-98. 1979: Geology of Puddle Pond map area, southwestern Newfoundland; in Current Research, Part A,

Geological Survey of Canada, Paper 79-1A, p. 305-310. 1954: The iron deposits of Indian Head area; in Contributions to the Economic Geology of Western Newfoundland, Geological Survey of Canada, Bulletin 27, p. 42-62.

1983a: Notes on the metamorphic rocks in the Corner Brook area (12A/13) and regional correlation of the Fleur de Lys Belt, western Newfoundland; in Current Research, Newfoundland Department of Mines and Energy, Mineral Development Divison, Report 83-1, p. 41-50. 1983b: Geology of the Island of Newfoundland; Newfoundland Department of Mines and Energy, Mineral Development Division, Map 83-106.

1983: Geology of the King George IV Lake map area (12A/4); Newfoundland Department of Mines and Energy, Mineral Development Division, Report 83-4, 67 p.

1981: Geology of the Corner Brook Lake area, western Newfoundland; unpublished M.Sc. thesis, Memorial University of Newfoundland, 370 p.

Knapp, D.A., Kennedy, D.P., and Martineau, Y.A. 1979: Stratigraphy, structure and regional correlation or rocks at Grand Lake, western Newfoundland; in Current Research, Part A, Geological Survey of Canada, Paper 79-1A, p. 317-325.

Society of London, v. 137, p. 41-59. 1962: Stephenville map area, Newfoundland; Geological Survey of Canada, Memoir 323, 72 p. Simmons, E.C. and Hanson, G.N. 1978: Geochemistry and origin of massif-type anorthosites. Contributions to Mineralogy and

Petrology, v. 66, p. 119-135. Vein systems and porphyroblasts in high temperature high strain zones: their bearing on the nature of shearing. Journal of Structural Geology.

1987a: Geology of the Dashwoods Pond, St. Fintan's and Main Gut Map areas, southwest Newfoundland; in Current Research, Part A, Geological Survey of Canada, Paper 87-1A, p. 399-408.

1987b: Geology of the Main Gut map area (12B/8), southwest Newfoundland. Geological map (scale 1:50 000) with descriptive notes. Geological Survey of Canada, Open File Report 1467.

Van Berkel, J.T., Johnston, H.P. and Currie, K.L. 1986: A preliminary report on the geology of the southern Long Range, southwest Newfondland; in Current Research, Part B, Geological Survey of Canada, Paper 86-1B, p. 157 to 170. Van Berkel, J.T. and Currie, K.L. 1986: Geology of the southern Long Range, southwest Newfoundland (12B/1, 12B/8, 12B/9, 12A/5, 12A/2). Geological map (scale 1:50 000) with descriptive notes. Geological Survey of Canada,

Open File Report 1328. 1949: Geology and mineral deposits of the area between Corner Brook and Stephenville, western Walthier, T.N.

Newfoundland; Newfoundland Geological Survey, Bulletin 35, Part 1. 1977: Ophiolitic mélange and its significance in the Fleur de Lys Supergroup, northern Appalachians.

Canadian Journal of Earth Sciences, v. 14, p. 987-1003. 1979: Appalachian Orogen in Canada; Canadian Journal of Earth Sciences, v. 16, p. 792-807. 1985: Geology, Stephenville map area, Newfoundland; Geological Survey of Canada, Map 1579A (scale 1:100 000 with descriptive notes).

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