

## DIMENSION-STONE STUDIES IN NEWFOUNDLAND AND LABRADOR, 2004

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### ABSTRACT

Former, producing and potential dimension-stone sites were examined in western and southeastern Labrador and also in western and eastern Newfoundland. In Labrador, near Ossokmanuan Lake, west of Churchill Falls, aggregate quarries in gabbro have little potential for the production of any block size. East of Cartwright, green monzonite and pink granite have some potential for the production of mid-sized blocks. The cream-coloured sandstones of the Bradore Formation, in the L'Anse au Clair area, have good potential for large blocks. On the island in the Flower's Cove area, dolomitized limestone have potential for mid-sized blocks. In the Cat Arm–Main River area, local exposures of granitic gneisses, granites and amphibolite dykes could produce small blocks. A graphite-speckled marble from the Coal Brook area, in southwestern Newfoundland, has potential for the production of small blocks of ornamental or carving stone and a quarry near Upper Island Cove, in eastern Newfoundland, produces grey flagstone.

### INTRODUCTION

Some former dimension-stone prospects, one producing quarry, and several other potential sites were visited and surveyed during 2004. The areas visited were: 1, Trans-Labrador Highway (Route 500) at Ossokmanuan Lake, about 50 km west of Churchill Falls; 2, the southern Labrador highway (Route 510) from L'Anse-au-Clair to Cartwright and its branch roads; 3, the Flower's Cove area on the Northern Peninsula; 4, the Cat Arm and Main River areas of the Northern Peninsula; 5, the southern Long Range Mountains, east of Coal Brook; 6, the Pacquet Harbour area on the Baie Verte Peninsula; and 7, the Carew Services Ltd. flagstone quarry near Upper Island Cove, Conception Bay (Figures 1 and 2).

It is essential when assessing the dimension-stone potential of a rock outcrop to determine the size and shape of the blocks that could be extracted. If the rock has potential for use as tiles or slabs, block size and shape are important factors. Gang-saw-sized blocks are mainly used to produce tiles and slabs for flooring, wall cladding, countertops, etc. The raw blocks are rectangular and have a volume of at least 3 m<sup>3</sup> but are commonly much larger having volumes in the range of 5 to 8 m<sup>3</sup>. A small gang-saw block would commonly have a minimum length of 2.4 m, a minimum width of 1.2 m and be at least 1.0 m thick. A block of gabbro with these dimensions and a density (specific gravity) of 3.0 (= 3 tonnes per cubic metre) would weigh 8.6 tonnes. A similar-

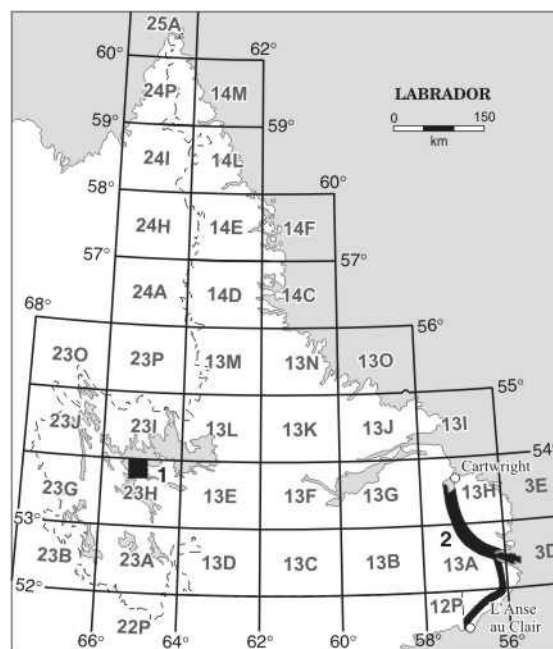
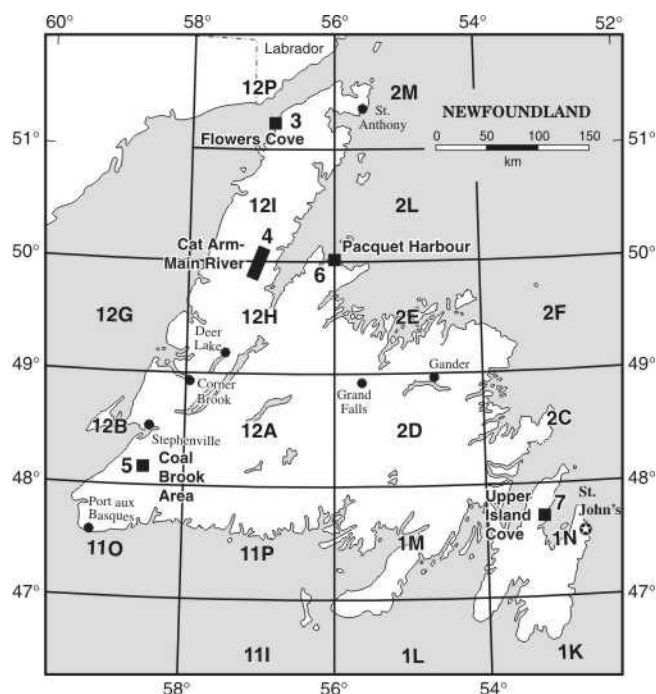


Figure 1. Location of study areas (numbered) in Labrador.

sized block of granite or marble with a density of 2.6 would weigh around 7.5 tonnes. For tile and slab production, quarry blocks are squared up before the tiles are cut. This increases the wastage. The amount of wastage is reduced by having rectangular blocks and using as large a block as can be handled by the saws. It is essential that a potential

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**Figure 2.** Location of study areas (numbered) in Newfoundland.

quarry be able to produce a large number of regularly shaped and sizeable blocks if it is to be viable. At every stage of production there is a loss of material and this must be kept to a minimum. In specialized work where a particular variety of rock is needed, smaller blocks may be acceptable but production costs can be increased significantly.

#### WESTERN LABRADOR

Two former dimension-stone properties located about 55 km west of Churchill Falls were examined to assess their dimension-stone potential. The first is located near the southeast corner of the northern portion of Ossokmanuan Lake on the north side of Route 500 (NTS map area 23H/6; UTM 361235E 5919095N; Zone 20; NAD27) and includes a small disused road-aggregate quarry. Other exposures of gabbro lie close to the main Churchill Falls power lines. These mafic rocks, which form part of the Ossok Mountain Intrusive Suite (James, 1994) are a pale grey, medium-grained, pyroxene gabbro containing scattered granitic veinlets. Jointing and fracturing are locally closely spaced and the only rock exposed lies around the low rim of the quarry. There is little potential for block production and the colour of the rock is not exceptional.

The second property is located on the south side of Route 500, about 16 km farther to the east of the previously described site, and about 2 km to the northeast of the northern portion of Ossokmanuan Lake (NTS map area 23H/7; UTM 373070E 5925930N; Zone 20; NAD27). The site is a

major aggregate quarry, currently disused. The rock in the quarry is a coarse-grained, black to charcoal-grey, pyroxene-plagioclase gabbro (individual crystals average 5 mm in length) that forms part of the Mount Fyne Pluton (Nunn, 1990). The quarry walls are up to 25 m high and a large amount of material is exposed. Oversized blocks have been stockpiled in, and near, the quarry (Plate 1a). The quarry faces and oversized blocks are cut by variably spaced and orientated joints and fractures; granite veining is also common. Blocks having a volume of greater than 1 m<sup>3</sup> and free of joints or veins were not found and the oversized blocks left on the quarry floor all contain joints or veins. Polished samples from this site highlight the pyroxene and plagioclase crystals and the subophitic texture (Plates 1b and c) and also the intense black colour of part of the gabbro. The site has little potential for block production but could supply small polished slabs suitable for ornamental use.



**Plate 1a.** Gabbro aggregate quarry, east of Ossokmanuan Lake.

#### SOUTHERN LABRADOR

Rock exposures were assessed for their dimension-stone potential along Route 510 in southern Labrador from the Labrador-Quebec border to Cartwright, the branch roads to St. Lewis and Charlottetown, and the available forest-access and radar-site roads in the Cartwright area. Only two areas were noted to have any potential and these are in the Cartwright and L'Anse-au-Clair areas. All other outcrops observed along the southern Labrador roads are highly fractured and show little potential for the production of blocks. Some granites are very regularly jointed and could produce small building blocks but the distance from any markets probably precludes any development.

From 2 km to the east of Cartwright over a distance of 1.5 km, several large outcrops of two varieties of granite are



**Plate 1b.** Polished slab of black gabbro from aggregate quarry, east of Ossokmanuan Lake.



**Plate 1c.** Polished slab of dark grey gabbro from aggregate quarry, east of Ossokmanuan Lake.

exposed along, and adjacent to, the gravel road leading to the transmitter towers and the abandoned radar site. The area was reconnaissance mapped by Owen *et al.* (1983) who noted that the rocks in the area commonly show gradational changes from one rock type to another. Near the bottom of the hill (NTS map area 13H/10; UTM 500870E 5952000N; Zone 21; NAD 27), a pink, coarse-grained, equigranular, weakly foliated to sheared, locally garnetiferous, pyroxene granite is exposed in a large cleared area. The granite displays widely spaced joints and has potential for large blocks (Plate 2a). Samples were collected for cutting and polishing. Slabs were cut parallel to and across the weak foliation (Plates 2b and c). The polished samples show the coarse texture of the granite.

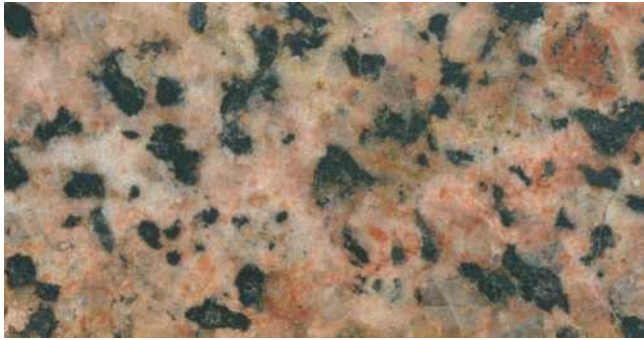


**Plate 2a.** Granite exposure east of Cartwright.

Toward and at the top of the hill, the pink granite appears to grade into a green-brown, coarse-grained, equigranular, undeformed, plagioclase–pyroxene monzonite. The monzonite is well exposed at the top of the hill (NTS map area 13H/10; UTM 502280E 592754; Zone 21; NAD 27) where there are several large, rounded outcrops (Plate 3a); the now-abandoned and dismantled radar building was erected on bedrock. In the monzonite, joint spacing is variable but several smooth outcrops display widely spaced joints. These outcrops could produce moderate-sized blocks of around 10 tonnes. A polished sample of monzonite displays a deep green-brown (bronze) colour and a uniformly coarse texture (Plate 3b).

In the L'Anse-au-Clair area, in southern Labrador, flat-lying, light-brown to beige, very thick sandstone beds of the Bradore Formation (Bostock *et al.*, 1983) are exposed on





**Plate 2b.** Polished slab of Cartwright granite, cut parallel to the foliation.

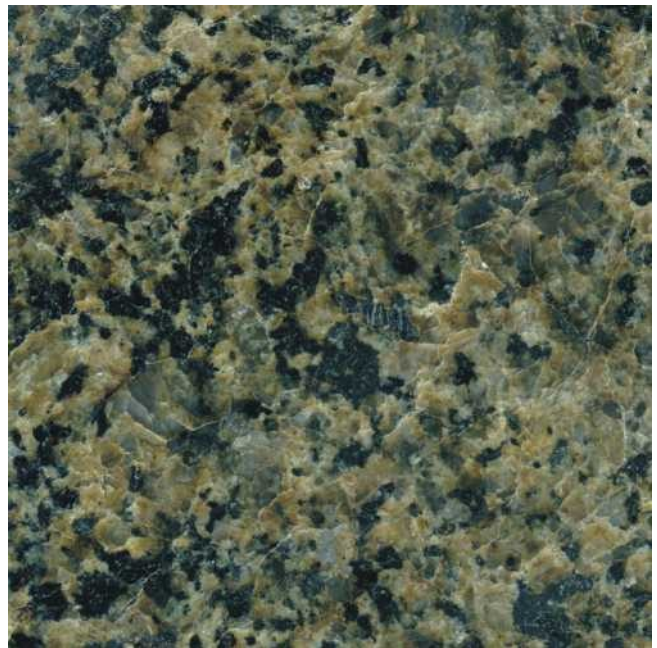


**Plate 2c.** Polished slab of Cartwright granite, cut across the foliation.

cliff faces along the coast, hill tops (Plate 4a) and several rock-cuts in the area. The sandstone commonly has widely spaced joints and no cleavage, crosslamination and graded bedding are commonly seen, and quartz veining is rare. Blocks weighing about 25 tonnes could be obtained along with numerous smaller but still sizeable blocks. Stone-quarry sites could be located behind the hills near the main road and would not intrude into the spectacular vistas available in the area. Samples from a rock-cut south of L'Anse-au-Clair (NTS map area 12/P6; UTM 495750E; 5697900N; Zone 21; NAD27) were cut parallel to, and across, the bedding and polished. The polished slabs are a light-beige and clearly



**Plate 3a.** Outcrop of Cartwright monzonite at abandoned radar station.



**Plate 3b.** Polished slab of Cartwright monzonite.

display small rock and mineral pebbles in a sandy matrix and also exhibit coarse cross-lamination (Plates 4b and c).

#### **NORTHWEST NORTHERN PENINSULA**

Near Flower's Cove, on the northwestern side of the Northern Peninsula, dolostones of the Petit Jardin Formation (Knight and Edwards, 1986) are exposed in a disused quarry about 1 km east of the town (NTS map area 12P/7; UTM





**Plate 4a.** Flat-lying, thick-bedded sandstone of the Bradore Formation, north side of L'Anse au Clair.

520185E 5683630N; Zone 21; NAD27) and also along the main highway in Flower's Cove. The gently dipping, cream dolostone beds are strombolitic and contain thin siliceous seams. The beds are up to 1 m thick and have a parting along the bedding planes. The vertical joints trend in three main directions and are widely spaced. Joint bounded blocks are up to 2 m long and about 1 m wide (Plate 5a) and there is potential for moderate-size blocks of about 2 m<sup>3</sup> in the quarry area. The blocks exposed along the highway are generally about 1 m<sup>3</sup> and many could easily be extracted without the need for cutting. A block of dolostone was cut across, and parallel to, the wavy horizontal laminae and then polished. The polished samples display the laminae as diffuse light-brown to darker brown elongate patches in the slab cut parallel to the lamina, and as elongate diffuse streaks in the slab cut across the laminae (Plates 5b and c). This slab also shows the crenulate stylolites and grey patches of partially dolomitized limestone. The dolostone could be used for tiles or small countertops.

### SOUTHEAST NORTHERN PENINSULA

On the southeastern portion of the Northern Peninsula, various undeformed granites and gabbro, strongly foliated granitic gneisses, migmatites, marbles and metasediments, and foliated to massive diabase dykes, are exposed along the numerous access roads extending to the west and north off Route 420 to Jackson's Arm. Several of these occurrences were noted to have dimension-stone potential.

Along the access road from Jackson's Arm to the Cat Arm Reservoir, bedrock has been exposed in many places,



**Plate 4b.** Polished slab of Bradore Formation sandstone, cut across the bedding plane.



**Plate 4c.** Polished slab of Bradore Formation sandstone, cut parallel to the bedding plane.



**Plate 5a.** Flat-lying dolostone bed of the Petit Jardin Formation, east of Flower's Cove.

and aggregate quarries have been developed for road and dam construction. Most of the rock in the rock-cuts and quarries is highly fractured and jointed and has little potential for large blocks. In the large quarry 500 m east of the Cat Arm Reservoir (NTS map area 12/I2; UTM 506450E 5546660; Zone 21; NAD27), a variety of granitic gneisses and migmatites are displayed along the quarry faces. Fracturing is generally closely spaced (<30 cm) and randomly orientated. The gneisses have thin bands generally less than a centimetre thick. The migmatite displays a banding that is much thicker (about 10 cm) and is commonly highly convoluted. A stockpile of oversized blocks, possibly kept for use as armour stone, is located at the entrance to the quarry. These blocks are commonly about 2 m long and 1.5 m thick (Plate 6a). Jointing is common in the oversized blocks, hence they cannot be used for the production of many large slabs (60 by 60 cm) from the one oversized block. Samples were collected for cutting and polishing parallel to, and across, the foliation. A polished slab of migmatite displays the bright pink granitic portion of the migmatite and the green portion is composed of plagioclase that has been altered to epidote and also the thin black bands of biotite (Plates 6b and c).

About 31 km west-northwest of Sop's Arm (NTS map area 12H/14; UTM 478610E 5523810N; Zone 21; NAD 27), a large outcrop of massive, coarse-grained, equigranular granite is exposed along the side of the road. The granite has very few joints over an exposed width of 10 m and is unusual in having amethyst-coloured quartz, pale pink and pale green feldspar and black hornblende (Plate 7). Sizeable blocks could be obtained from this outcrop but it is uncer-



**Plate 5b.** Polished slab of Flower's Cove dolostone, cut parallel to the laminae.



**Plate 5c.** Polished slab of Flower's Cove dolostone, cut across the laminae.

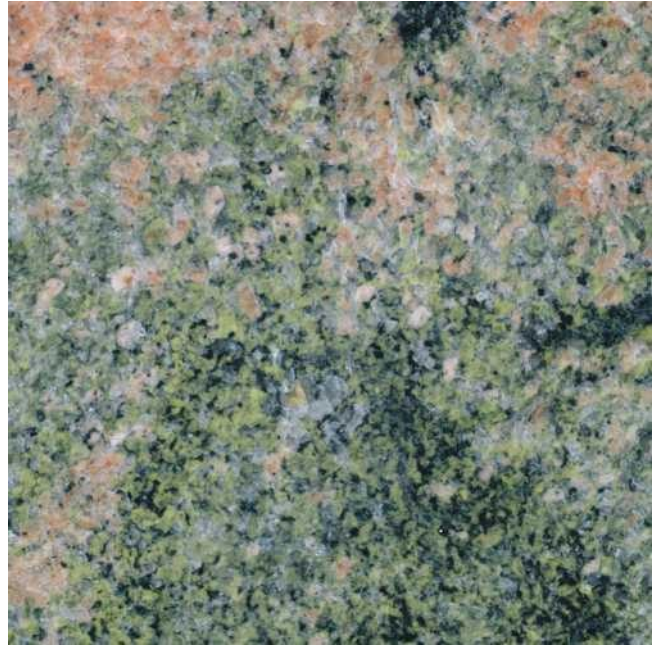




**Plate 6a.** Block of migmatite gneiss at the Cat Arm Dam quarry. Scale card is 8 cm long.

tain if the rock is a very large glacial erratic or part of a large dyke. The geology map of the area (Owen, 1991) indicates that area is underlain by gneisses, therefore, the granite occurrence is probably a very large glacial erratic. If so, it is possibly derived from the extensive Lac Michel intrusive suite located about 15 km to the north.

About 10 km northwest of Sop's Arm, pink, banded granitic gneiss has been examined by several prospectors as a potential source of dimension-stone blocks. Part of the area is currently held by Sherry Dunsworth (Mineral license 7633M) who has assessed the potential of the gneisses for dimension stone. Several localities exposed along the forest-access road were examined and the samples cut parallel to, and across, the foliation and then polished. At one locality (NTS map area 12H/14; UTM 498010E 5518480N; Zone 21; NAD27) moderate-sized blocks of gneiss having a well-developed parallel banding, were loosened during road construction and show that some regularly shaped blocks up to about 2 by 1 by 0.5 m could be extracted (Plate 8a) but most are significantly smaller. A sample was cut and polished parallel to, and across, the foliation giving quite different appearances to the slabs (Plates 8b and c). At another locality about 150 m to the west (NTS map area 12H/14; UTM 497745E 5518495; Zone 21; NAD27), a similar gneiss is exposed (Plate 9a). Jointing is much less regular and the banding not as uniformly developed, being more discontinuous and having varying thicknesses and diffuse boundaries. Also, a sample was cut parallel to, and across, the foliation and shows the well developed pink granitic portions of the rock and the biotite-rich selvages (Plates 9b and c).



**Plate 6b.** Polished slab of migmatite gneiss from the Cat Arm Dam quarry, cut parallel to the foliation.

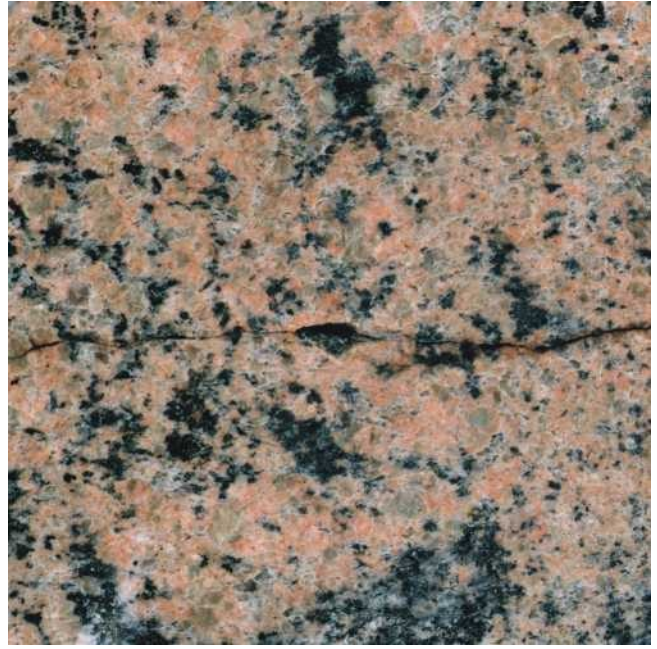


**Plate 6c.** Polished slab of migmatite gneiss from the Cat Arm Dam quarry, cut across the foliation.





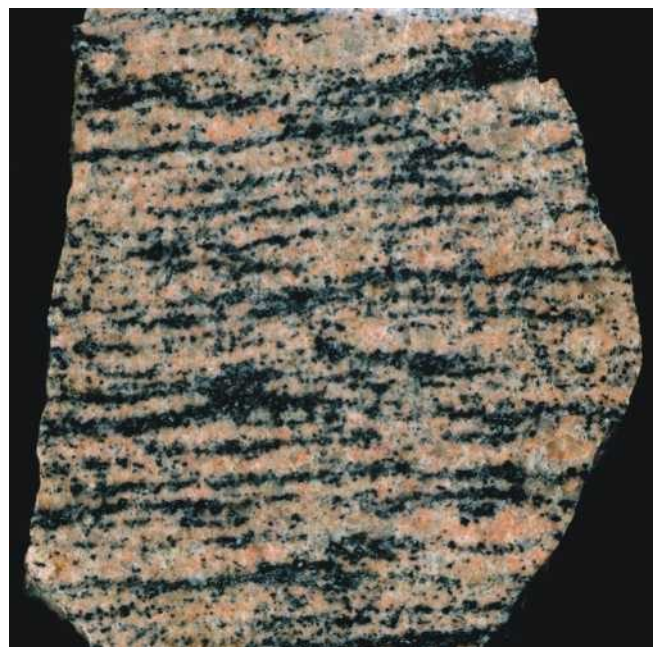
**Plate 7.** Polished slab of granite from the Eagle Lake area, located about 31 km west-northwest of Sop's Arm.



**Plate 8b.** Polished slab of banded gneiss from the area west of Sop's Arm, cut parallel to the foliation.



**Plate 8a.** Joint blocks of banded gneiss from the Long Range Mountains, west of Sop's Arm. Notebook is 17 cm long.



**Plate 8c.** Polished slab of banded gneiss from the area west of Sop's Arm, cut across the foliation.



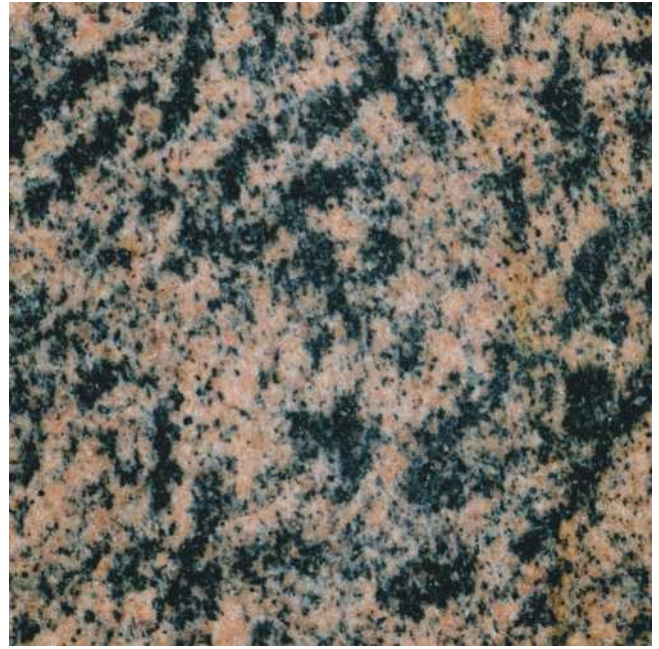


**Plate 9a.** Joint blocks of wispy-banded gneiss from the Long Range Mountains, west of Sop's Arm. Scale card is 8 cm long.

Diabase dykes are exposed along roads throughout the Main River–Cat Arm Reservoir area. The dykes vary in thickness from about 1 m to over 30 m and include massive, fresh and undeformed to foliated and metamorphosed varieties. The metamorphosed dykes contain abundant amphibole and lesser plagioclase and are generally highly fractured and have no potential for block production. On the south side of Main Brook (UTM 485655E 5495640, Zone 21, NAD 27), about 3 km north of Silver Mountain, one metamorphosed and weakly foliated dyke is over 10 m thick and contains widely spaced joints (Plate 10a). Bulldozed, blasted blocks are up to 2 m long and about 1 m thick. The diabase is a black, medium-grained, foliated amphibolite containing a small proportion of stretched plagioclase. A sample that was cut parallel, and across the foliation, takes a good polish and is black on the polished surfaces (Plates 10b, 10c); however, the amount of amphibolite available is limited and the rock may only have potential as an ornamental stone.

**LONG RANGE MOUNTAINS, SOUTHWEST NEW-FOUNDLAND**

Several bands of marble were discovered along forest-access roads and in streams and on ridges about 11 km east-northeast of the village of Coal Brook by Mr. Tony MacNeil of South Branch. This area is located to the southeast of the Long Range Fault (Cabot Fault), and within the northwestern margin of the Long Range Mountains (Chorlton and Knight, 1983). Chorlton and Knight (*op. cit.*) indicated the presence of a variety of bands and lenses of marble about



**Plate 9b.** Polished slab of wispy-banded gneiss from the area west of Sop's Arm, cut parallel to the foliation.



**Plate 9c.** Polished slab of wispy-banded gneiss from the area west of Sop's Arm, cut across the foliation.





**Plate 10a.** *Outcrop of foliated amphibolite dyke 3 km north-east of Silver Mountain.*

500 m to the southeast and extending for about 15 km to the southwest. The first new occurrence of marble is located along a woods road (NTS map area 11O/15; UTM 362480E 5316020N; Zone 21; NAD27) and contains highly fractured white marble. This material does not have any potential for dimension-stone use and appears to be of very limited extent. The second occurrence is located in a stream about 500 m to the east (NTS map area 11O/15; UTM 362720E 5316020N; Zone 21; NAD27) where it lies within a sequence of migmatized metasediments. White marble is exposed along the stream (Plate 11a) for a distance of about 100 m and is unusual in that it contains abundant specks of graphite that are weakly aligned. Jointing is in several directions and generally is closely spaced; therefore, no large blocks are apparent along the stream. The largest blocks are over 1 m long but only up to about 50 cm thick. A sample of marble was cut parallel to and across the foliation and polished (Plates 11b and c). The graphite flakes are quite prominent and the marble takes a good polish and displays an unusual appearance for marble. However, the small size of the blocks would preclude use for the production of tiles or slabs but could be suitable for the limited production of small items such as carvings or trophy bases.

**DUNAMAGON GRANITE**

The Dunamagon Granite is an extensive northeast-trending pluton (Hibbard, 1983) having its northeast termination exposed along Route 417 on the west side of Pacquet Harbour, 23 km east of Baie Verte, between Woodstock and Pacquet. About 2.6 km of granite are exposed along the shoreline and adjacent rock-cuts. The southern contact is



**Plate 10b.** *Polished slab of amphibolite from 3 km north of Silver Mountain, cut parallel to the foliation.*



**Plate 10c.** *Polished slab of amphibolite from 3 km north of Silver Mountain, cut across the foliation.*





**Plate 11a.** *Outcrop of white, graphitic marble in a stream, 11 km east-northeast of Coal Brook, southwest Newfoundland.*

located about 200 m west of the Pacquet turnoff at UTM 579640E 5535700N (NTS map area 2E/13; Zone 21; NAD 27). The granite is pink and locally grey, medium to coarse grained, equigranular, contains less than 5 percent biotite and has a weak foliation. A few diabase dykes, small quartz veins and pegmatites cut the granite and are of minor extent. A prominent feature of the granite exposed in the rock-cuts is the intense jointing. The spacing and orientation of the jointing varies across the granite, being irregular in orientation toward the northern contact and becoming more regular toward the southern contact. Only rarely are large slabs of granite present and they are generally less than 50 cm thick. In the central and southern rock cuts, the granite is commonly cut by three sets of orthogonal joints set nearly horizontal and vertical (Plate 12a). The variation in joint spacings has produced granite slabs suitable for flagstones, larger blocks up to 1 m<sup>3</sup> that could be used for slabbing, and an abundance of small, rectangular blocks suitable for rock walls and cobbles. Some local homeowners have gathered fallen rock and constructed garden walls (Plate 12b).

#### UPPER ISLAND COVE

Carew Services Ltd. has developed a small flagstone quarry near Upper Island Cove, Conception Bay North, which is currently held under a quarry permit. Sandstone flagstone is sporadically produced from this site which is located at the crest of a ridge (UTM 331600E 5280390N, Zone 22, NAD 27), about 1 km northwest of Upper Island Cove. The sandstone has been assigned to the Trepassey Formation of the St. John's Group (King, 1988). The sandstone is grey, fine grained, and cleaved and beds are 30 to 70 cm thick. The rocks form the crest of a very shallow dome



**Plate 11b.** *Polished slab of white, graphitic marble from a stream, 11 km east-northeast of Coal Brook, southwest Newfoundland, cut parallel to the foliation.*



**Plate 11c.** *Polished slab of white, graphitic marble from a stream, 11 km east-northeast of Coal Brook, southwest Newfoundland, cut across the foliation.*



**Plate 12a.** Orthogonally jointed Dunamagon Granite in a rock cut along the Pacquet road, 2 km northwest of Woodstock.



**Plate 13a.** Carew Services flagstone quarry near Upper Island Cove.



**Plate 12b.** Garden wall in Woodstock constructed from blocks of the Dunamagon Granite.

and are cut by a near-vertical, spaced cleavage having cleavage planes 1 to 8 cm apart (Plate 13a). The near-vertical jointing is widely spaced in three main directions. The rock also parts along the bedding planes. Open joints are commonly rusty (Plate 13b). The size of the sheets is limited by the bedding planes. The resource appears to be limited as jointing increases in intensity away from the current quarry area.

### ACKNOWLEDGMENTS

Dick Wardle is thanked for his review of the paper.



**Plate 13b.** Well-cleaved sandstone in the Carew Services quarry near Upper Island Cove. Notebook is 17 cm long.

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