Newfoundland Labrador

Natural Resources

Mines

SUMMARY NOTES TO ACCOMPANY GEOLOGICAL MAP (MAP 2015-08) OF THE NAIN AREA (NTS 14C/12)

(BASED MOSTLY ON FIELD WORK IN 1999 AND 2000)

B. Ryan

Open File 014C/12/0154

St. John's, Newfoundland
October, 2015

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Recommended citation:

Ryan, B.

2015: Summary notes to accompany geological map (Map 2015-08) of the Nain area (NTS 14C/12) (based mostly on field work in 1999 and 2000). Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Open File 014C/12/0154, 46 pages.

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OVERVIEW

The following summary notes are an updated version of ones produced in 2001, containing corrections and revisions of the earlier set. They describe some salient features of the geological subdivisions for the Nain map-sheet (NTS 14C/12). The descriptions are mostly field oriented, but some thin section features are included as well. These notes, and the compilation map, are subject to revision because the extrapolations of specific units into some parts of the area, as well as the interpretation of the relationships between them, have, in some cases, been predicated on limited groundwork. Most of the internal subdivisions of the anorthositic rocks have been made on the basis of mesoscopic textural attributes, many of these rocks having identical microscopic characteristics. Continuity, correlation and relative ages of certain units are open to debate. Users are encouraged to independently re-examine the geology, and employ their own judgment regarding the possible extent and significance of each subdivision.

The listing order of stratigraphic units under each heading does not necessarily correspond to relative stratigraphic age, but some established and surmised relationships are indicated with each unit. The absolute crystallization ages presented were determined, unless otherwise noted, by M.A. Hamilton at the Geological Survey of Canada, Ottawa. The geochronology includes previously published information, as well as hitherto unpublished ages determined specifically for this project.

NOTE ON THE USE OF GEOGRAPHIC NAMES EMBEDDED IN THE BASE MAP *VERSUS* THOSE USED BY LOCAL RESIDENTS

Nain residents have names for some geographic features that are different from those given on the topographic base map used for the geological compilation. In addition, other features not named on the map have local names. These local names have been added to the map, and a marginal map note complementary to these additions is provided. References to geographic locations in the following geological descriptions, however, retain the base-map-embedded names, except in cases where none exists. The retention of the base map spellings is in keeping with the extant informal stratigraphic nomenclature.

MAFIC, ULTRAMAFIC, AND FELSIC ROCKS OF ASSUMED ARCHEAN AGE

This subdivision includes both inter-pluton septa of gneissic rocks assumed to be country-rock belonging to the Archean Nain Province, as well as deformed rocks of uncertain relative place in the regional stratigraphy. Some of the layered mafic sequences, especially in areas where they contain anorthositic and leuconoritic members, fall into the latter category, and could be younger than Archean. Whereas the layered rocks have no direct counterparts among the undeformed Mesoproterozoic intrusions of the Nain Plutonic Suite (NPS), they do resemble a recrystallized layered intrusion, The Bridges, of possible Paleoproterozoic age, in the Ten Mile Bay area. The paucity of mafic dykes within the rocks of this subdivision, in contrast to the abundance of Paleoproterozoic dykes elsewhere in the Nain Province, is a trait that makes these septa different from most of the other Archean rocks of Labrador.

A?mu

Layered sequence of ultramafic, melanocratic to mesocratic gabbronoritic, and anorthositic rocks

Distribution: This map unit includes several separate belts of slightly overall differing aspect occurring in the Webb's Point area, between Sachem Bay and Nain Bay, south of Nain Bay, and southwest of Akpiksai Bay. If these are Archean rocks, they comprise an unusually large and continuous group compared to similar rocks elsewhere in the Nain Province.

Characteristics: For the most part this is a non-migmatized sequence of rocks derived from a layered intrusion (or several such intrusions); however, an abundance of closely spaced granitic veins locally imparts a migmatitic appearance. Mineral assemblages are consistent with granulite-facies metamorphism (*i.e.*, both clino- and orthopyroxene), although the original mafic rocks may have been gabbronoritic such that the two pyroxenes are (recrystallized?) primary constituents. Both the ultramafic and melanocratic mafic parts of this group contain olivine. Even though anhydrous assemblages prevail, brown hornblende is widely developed in all compositional variants. The two-pyroxene assemblage in this map-unit is overprinted by varying degrees of secondary alteration at greenschist-facies, which has generated chlorite, actinolite, sericite, serpentine, and carbonate.

The melanocratic and mesocratic members exhibit a homogeneous granular ('salt-and-pepper') to diffusely layered aspect, and display a wide distribution (*e.g.*, south of Nain Bay, northwest of Sachem Bay, west of Webb's Point) of oval and irregular grey blotches comprising granoblastic, fine-grained combinations of plagioclase, clinopyroxene, orthopyroxene, hornblende and opaque oxide. These blotches are provisionally interpreted to be decompression breakdown products of earlier garnets, having no garnet remaining ('garnet ghosts').

Ultramafic rocks, most of which are olivine-bearing, are dark brown to reddish brown and well layered; generally they are podiform, metre-scale layers within the mafic and mesocratic rocks, but a unit over 10 m wide is present west of Webb's Point. Some of the peridotitic rocks (*e.g.*, harzburgite in the northern belt west of Sachem Bay) contain well-preserved cumulus olivine.

The anorthositic and leucogabbronoritic components of this unit are subordinate to the other rock types, being best displayed south of Ka' ngilia' luk (*i.e.*, south of Nain Bay), on the ridge west of Nain, and west of Sachem Bay. For the most part the leucocratic rocks are granular types having a streaky pyroxene foliation. Original feldspar shapes are locally oval, and a greenish-blue labradorite schiller, a feature in common with the anorthosites of the NPS, is present in some of the feldspars. The granular anorthositic rocks of this unit superficially resemble adjacent younger foliated leuconoritic rocks, but differ from them in having a polyphase structural history.

Regional Structure: Layering (in part a primary compositional feature) and foliation within this unit are affected by the regional-scale folds northwest of Sachem Bay and south of Ka' ngilia' luk, and a secondary fabric related to the latter structure is locally present.

Stratigraphic Relationships: This unit is regionally concordant with the attitude of the migmatitic layering in the quartzofeldspathic gneisses (**Aggl**). It is possible that it represents a layered intrusion of Paleoproterozoic age, but the abundance of mafic, ultramafic and (lesser) leucogabbroic fragments, superficially identical to parts of the layered sequence, within the quartzofeldspathic rocks implies that the layered sequence is the older of the two units and thus likely Archean (unless the enclosing quartzofeldspathic gneiss itself is a Paleoproterozoic rock). Quartzofeldspathic gneiss is locally interlayered with the layered sequence (but is not distinguished separately on the map), especially in the north–south belt west of Sachem Bay, and may be derived from granitoid sheets. Centimetre-scale layers and veins, as well as granular dykes, of white anorthosite and leucogabbronorite, are locally present (*e.g.*, southwest of Akpiksai Bay and west of Webb's Point); these are folded and foliated, and cannot be reliably separated from the unit itself, *i.e.*, cannot be unequivocally correlated with proximal younger anorthositic intrusions. Melanocratic dykes are present in anorthositic and leucogabbroic members south of Ka' ngilia' luk and east of Conch Bay, some of which postdate a foliation in their hosts but which are also deformed. One deformed ultramafic dyke (meta-lamprophyre??) is discordant to both compositional layering and deformational foliation south of Ka' ngilia' luk. Metre-scale sheets of (Archean?) pale grey to brownish-grey, orthopyroxene-bearing, granitic (enderbitic) rock intrude the unit west of Akpiksai Bay.

Relationships with NPS intrusions are exposed at several locations. The layered unit is intruded by the abutting Tikkiraluk Hill troctolite (**MTtr**), and presumably by the Sachem Bay ferrodiorite (**MSfd**), west of Webb's Point. It is intruded by seriate-textured leuconorite (**Msln**) and the Sachem Bay ferrodiorite west of Sachem Bay; in the same area, it is in 'tectonic' contact with the foliated margin of the Mount Lister intrusion (**MMLfm**), the interface locally having a sill of rusty brown, oxide-apatite-rich, olivine-bearing ferrodiorite separating the layered rocks from the deformed anorthositic rocks. South of Nain Bay the layered sequence is intruded by the Hosenbein Lake olivine gabbro and leuconorite (**MHg, MHln**), and by the orthopyroxene-bearing leucotroctolite of the Tessiuyarsuk intrusion (**MTlt**). The unit is intruded by, but now in variably tectonized contact with, foliated leuconorite of the Unity Bay intrusion (**MUfz**) in the Nain Hill and Akpiksai Bay area. Mafic, ultramafic, and layered gabbronoritic rocks in the vicinity of Ship Hill could be rafts of this unit within the Unity Bay intrusion, but the lack of olivine in these inclusions makes the correlation doubtful. The layered rocks are also intruded by massive to mildly foliated leuconorite of the Akpiksai Bay intrusion (**MAln**) west of Akpiksai Bay, by weakly layered, fine-grained ferrodiorite (**Mlfd**) east of Pikalujak kangidlua, and by pale mauve-grey leuconorite and anorthosite of uncertain affinity (**M?mlna**) on the ridge northwest of Nain. On Nain ridge it is also intruded by straight-walled dykes of acicular-clinopyroxene (comb-textured) gabbro, and by magnetite-rich and sulphide-bearing dioritic dykes.

Aggl
Migmatitic granulite-facies quartzofeldspathic gneisses

Distribution: These rocks occur along the northern periphery of the map area (the Ugjutoarsuk (Webb's) Bay–Webb's Point–Challenger Cove sector), on the small island west of Barth Island, and on the south side of Nain Bay.

Characteristics: The unit includes mostly layered and migmatitic, granulite-facies, quartzofeldspathic gneisses of plutonic ancestry, characteristically containing centimetre- to tens-of-metre-scale rafts of mafic and ultramafic rock. Some of these gneisses, for example on the western side of the peninsula at the entrance to Challenger Cove and just north of the map area at Webb's Bay, contain 'Saglek dyke'-type mafic layers (*i.e.*, disrupted, massive, and non-migmatized mafic fragments that have plagioclase megacrysts, and interpreted to be deformed mafic dykes), implying an early Archean age for the host (*cf.* Bridgwater and Schiøtte, 1991). Diopside-rich calc-silicate rocks and corundum-rich metapelitic gneiss (emery-type rock having red corundum, dark green spinel, rutile and sillimanite) form metre-scale units east of Ugjutoarsuk (Webb's) Bay, and thin quartzite units occur within the gneissic screen enclosed by the quartz-monzonitic body on the highland east of Ugjutoarsuk (Webb's) Bay. Meta-anorthositic and metaleucogabbroic inclusions are locally present on the island west of Barth Island and south of Nain Bay. Less-deformed enderbitic rocks, having abundant angular inclusions of mafic and ultramafic rock, as well as irregular mafic enclaves, occur on the island west of Barth Island and south of Nain Bay, and may be preserved remnants of the plutonic protolith to the gneisses. The best preserved granulite-facies rocks locally contain orthopyroxene that is mildly poikilitic and displays clinopyroxene exsolution. Some of the high-grade assemblage may be a product of contact metamorphism from nearby intrusions. The granulite-facies aspect of the gneisses is masked in many places by a low-grade (chlorite, epidote) retrogression.

Regional Structure: The gneisses are regionally folded into a north-northeast-plunging, upright, antiform and synform pair north of the west end of Sachem Bay and a south-plunging, overturned, antiform south of Ka' ngilia' luk. A locally developed overprinting fabric is axial planar to the regional structures, but tightly appressed mesoscopic folds and an associated transposition foliation displayed by some outcrops predate these regional folds. A laminar, mylonitic-like layering, imposed following a period of mafic dyke (hornblende–biotite gabbronoritic rocks) emplacement, is locally present along the contact with the Mount Lister intrusion, but a link between the emplacement of this large intrusion, the proximal dykes, and the generation of the laminar layering is equivocal. A prominent lineation is locally present; the linear fabric in the gneisses on the south shoreline of Nain Bay may have been generated at the time of emplacement of the nearby Mount Lister intrusion.

Stratigraphic Relationships: The plutonic precursor to the felsic gneisses seems to have invaded and dismembered the abutting layered leucogabbronorite–gabbronorite–peridotite unit (**A?mu**). The gneisses are intruded by Paleoproterozoic(?) metagabbro (**P?gbn**) on George's Island. They are also likely intruded by the Paleoproterozoic(?) metagabbronoritic rock in the vicinity of Challenger Cove; the contact was not observed, but the intrusive relation is reasonable based on the contrast between the two rock types.

The gneisses are directly intruded by several plutons assigned to the Mesoproterozoic Nain Plutonic Suite, including the Sachem Bay ferrodiorite (**MSfd**) and the abutting granitoid rocks (**Msgr**) north of Sachem Bay, the ferrodiorite of the Barth Island composite intrusion (**MBIfd**) on the islet west of Barth Island, and the Hosenbein Lake intrusion (**MHln**) south of Nain Bay. The Mount Lister intrusion (**MMLa**) is also younger than the gneisses, but the contact between these two units is characterized by deformation along the interface where the gneisses abut both the

Mount Lister leuconoritic border zone (**MMLfm**) and the monzonite sheath (**Mlfmz**) that locally intervenes between the gneisses and the foliated leuconorite.

Minor mafic intrusions within the gneisses include i) schistose hornblende-rich gabbronoritic ('granulite') sills parallel to the laminar layering in rocks near the Mount Lister intrusion border, ii) internally and sigmoidally foliated, greenish, hornblende–gabbronorite dykes (of Mesoproterozoic age?) crosscutting layering on George's Island and on the highland east of Ugjutoarsuk (Webb's) Bay, and iii) foliated and non-foliate, massive to porphyritic, hornblende-free, opaque-oxide-rich, gabbronoritic or ferrodioritic dykes south of Nain Bay. Other dykes include a northwest-striking granitic (monzonitic) Kaiktusuak dyke (**Mkm**) south of Ka' ngilia' luk, and olivine-bearing diabase and gabbro dykes elsewhere.

A?om
Layered olivine-bearing mafic rocks and olivine-free, mesocratic, leuconoritic and anorthositic rocks

Distribution: This is an areally restricted unit occurring within leucocratic gneisses at the west end of the island west of Barth Island. Several outcrops of rock superficially similar to the structurally highest parts of this unit on the island occur at the west margin of the Barth Island intrusion north of Nain Bay. The affinity and absolute age for these rocks are uncertain. They could be allied with the layered rocks described above (**A?mu**), they could be Paleoproterozoic, or they could be part of the Mesoproterozoic NPS.

Characteristics: The main unit at the western tip of the island near Barth Island is a locally rusty-weathering and friable rock, containing abundant disseminated opaque oxide. It is layered and foliated, varying compositionally from anorthosite to peridotite, but dominated by a grey-brown, gabbronoritic type that is locally characterized by subhedral to lozenge-shaped dark grey to black plagioclase crystals up to 5 cm in maximum dimension. Melanocratic gabbronoritic and ultramafic rocks contain olivine and brown hornblende, a feature in common with the layered rocks above (**A?mu**). Some of the less intensely foliated gabbronoritic parts of the unit retain subophitic texture and well-preserved plagioclase crystals. The layered rocks on the island are overlain to the east by streaky-foliated leucogabbronoritic to anorthositic rocks similar to those associated with the layered sequence on the ridge northwest of Nain. The leucogabbronoritic rocks have isolated dark grey plagioclase megacrysts in a pale grey matrix, and also contain variably recrystallized dark brown to black orthopyroxene megacrysts.

Weakly foliated leucogabbronorite, having dark plagioclase megacrysts, occurs west of the Barth Island composite intrusion north of Nain Bay, and is similar to the one associated with the more melanocratic rocks on the island; both of these megacryst-bearing units resemble, but are not considered to be related to, megacryst-poor parts of the seriate leuconorite (**Msln**) west of Sachem Bay.

Regional Structure: This unit appears to have a simple structural history. No folds have been recognized, and only one foliation is present throughout the unit. The fabric is generally L-biased.

Stratigraphic Relationships: This unit is considered to be part of the envelope to the NPS, but no contacts with the NPS plutons have been observed. It could be Paleoproterozoic, perhaps a temporal equivalent of The Bridges layered intrusion (**P?BI**). The main unit at the western tip of island near Barth Island is bounded to the east and west by a leucocratic, anorthositic-looking, enderbitic to opdalitic rock, having mafic, ultramafic and anorthositic enclaves, some of which are folded; the western contact with the white-weathering unit is 'conformable', but the eastern contact with the quartzofeldspathic rocks (**Aggl**) is sheared. Though not seen in direct contact with any of the Mesoproterozoic plutonic rocks, it is assumed to be intruded by both the Mount Lister intrusion and the Barth Island composite intrusion north of Nain Bay. It is possible that it represents an unusual preservation of an outermost part of the Mount Lister border zone (**MMLfm**), that here is bounded by gneisses. It is transected by an olivine gabbro dyke on the island west of Barth Island.

IGNEOUS ROCKS OF PALEOPROTEROZOIC AND ASSUMED PALEOPROTEROZOIC AGE

These rocks are assumed to represent magmatism predating emplacement of the NPS, but they have little stratigraphic control on their ages.

P?gbn
Metagabbro and metagabbronorite

Distribution: This subdivision encompasses two bodies of amphibolitized and deformed gabbroic and gabbronoritic rocks exposed on George's Island (north edge of map sheet) and in Challenger Cove.

Characteristics: These are plutonic rocks of uncertain affinity, in which primary textures are well-preserved despite secondary high-temperature hydration. They are medium- to coarse-grained, having amphibolitized pyroxenes and variably recrystallized dark-grey plagioclase. The rock on George's Island is a metagabbro, which has subordinate orthopyroxene; that at Challenger Cove is a gabbronorite. In both areas the pyroxenes are partly replaced by a brown to greenish-brown hornblende. A pitted weathering aspect to parts of unit on George's Island suggests that olivine may be locally present, but none has been seen.

Regional Structure: These rocks are, for the most part, massive to very weakly foliated. Ductile 'hot shear zones' in which the igneous rock is transformed to foliated amphibolite and granulite are locally present, especially along the southeastern shore of Challenger Cove adjacent to the Port Manvers Run leucotroctolite (**MPMlt**). Some of the secondary features of the Challenger Cove rocks may be a consequence of the emplacement of the Port Manvers Run intrusion.

Stratigraphic Relationships: There is no absolute control on the age of these rocks. They could be late Archean, or even early intrusions of the NPS, but a Paleoproterozoic niche is preferred. The George's Island body is intruded into Archean gneisses (**Aggl**); the contact is locally sheared and indistinct. No contacts between the gneisses and the Challenger Cove body were observed. The George's Island body is intruded by amphibolitized and foliated metadiabase dykes on an islet

north of George's Island (just outside the map-area), and by a composite basic-silicic dyke on George's Island itself. The Challenger Cove body is assumed to be intruded by leucotroctolite of the Port Manvers Run intrusion (**MPMlt**) to the east of Challenger Cove.

P?BI

The Bridges intrusion: Well layered mesocratic to ultramafic rocks

Distribution: This sequence of layered rocks is located east of Two Mile Bay on Paul Island. It represents the northernmost extent of a southward-widening monoclinal unit that continues across Ten Mile Bay for over 5 km towards The Bridges Passage (from which the unit name is derived).

Characteristics: The Bridges intrusion is a compositionally layered group of gabbroic rocks which exhibits centimetre- to metre-scale layers ranging from melanocratic olivine-gabbronorite to anorthosite. Though recrystallized, The Bridges displays many primary magmatic depositional characteristics. These include abrupt compositional contrasts as well as graded layering. These appear to be anhydrous rocks, and limited investigation indicates that, unlike the melanocratic members of unit **A?mu**, the ultramafic rocks here lack hornblende. Clinopyroxenes in the mesocratic to melanocratic members of The Bridges have numerous plates and spindles of opaque oxide, as well as cleavage-controlled exsolution of another (clino?)pyroxene.

Regional Structure: The northern end of The Bridges is a south-plunging syncline (or synform), but southward (off map sheet on the south side of Ten Mile Bay) it has an east-dipping monoclinal form. Internally it displays pre-full-consolidation deformational features including 'slump folds' and 'slides' within the layering, and annealed syn-depositional faults that displace some layers but not overlying younger ones.

Stratigraphic Relationships: The Bridges intrusion has been subjected to Nd–Sm age determination by Ashwal *et al.* (1992). The results indicate that this is likely a Paleoproterozoic layered intrusion, yielding a crystallization age of 1667±75 Ma. The relationship between the regional attitude of the foliation in the deformed leuconorite to the west (Quarry intrusion, **P?Qln**) and the orientation of The Bridges layered rocks implies that the latter discordantly overlie the foliated leuconorite, but no contact has been observed. Foliation in leuconorite directly adjacent to The Bridges on its western side east of Two Mile Bay is parallel to the contact with the layered rocks, but this leuconorite may be part of The Bridges itself.

The layered rocks are truncated by Mesoproterozoic leucotroctolite to leuconorite (**Mlt**) east of Two Mile Bay. A raft of layered rocks derived from The Bridges Intrusion occurs within massive leuconorite (The Turnpikes intrusion, **MTla**) northeast of Two Mile Bay.

P?Qln

Quarry intrusion: Foliated grey to brownish grey leuconorite and anorthosite

Distribution: This unit is exposed on the peninsula between Two Mile Bay and Ten Mile Bay. Foliated rocks west of The Bridges intrusion just east of Two Mile Bay may be part of this unit, but could also be part of The Bridges itself. Dimension-stone quarries on the south and north

shores of Ten Mile Bay (outside the map area) are both considered to be within this unit, an interpretation reflected in the stratigraphic name.

Characteristics: The Quarry intrusion is a dark-grey to pale-grey to purplish-grey rock comprising leuconorite and anorthosite having variable grain size (2-10 cm usually); most plagioclase is anhedral, as if recrystallized, and tabular feldspar is uncommon. Within this rock are scattered recrystallized (high-alumina?) orthopyroxene megacrysts. Much of the plagioclase in the anorthositic and leuconoritic rocks of this unit displays a blue to blue-green labradorite schiller, a feature that has made these rocks a source of unique dimension-stone. The foliation in the Riflesight Hill and Ten Mile Bay area is chiefly defined by elongate streaks of granular orthopyroxene (± clinopyroxene, green hornblende), most, if not all, of which seems to be derived from the elongation (compaction??) of an original clotted (poikilitic) texture. Trains of variably recrystallized coarse orthopyroxene locally enhance this fabric. Within the rock closest to The Bridges layered sequence east of Two Mile Bay the foliation is more continuous and of L>S type in places; here the fabric is defined by fine continuous folia of granular pyroxene (this rock, in fact, may be part of The Bridges itself). The pyroxenes within the Quarry intrusion are locally chloritized, and epidote is locally prominent in some field exposures.

Regional Structure: The Quarry intrusion displays a regionally developed foliation, the fabric being predominantly east-striking and dipping gently to moderately south. The exception is east of Two Mile Bay where rocks included within this unit have a fabric that trends northerly and dips to the east. Nowhere in this unit is the deformational fabric like the 'tectonic' foliation in the rocks of the margin of the Mount Lister intrusion (*see* below), but rather it seems more like a recrystallized compaction feature and an enhancement of a discontinuous, thin (crystal-scale) layering.

Stratigraphic Relationships: The map pattern can be used to suggest that this unit was foliated prior to the emplacement and deposition of The Bridges intrusion (**P?BI**) and that the latter sits atop the leuconorite. If this is the case, and the 1667±75 Ma age for The Bridges is valid, then the Quarry intrusion is, in spite of its similarity to the more widespread leuconorites of the surrounding Mesoproterozoic NPS, possibly Paleoproterozoic in age. Within the Quarry intrusion are rare inclusions of older and more strongly deformed leuconorite and recrystallized anorthosite of uncertain affinity.

Foliated rock disposed as numerous rafts within massive leuconorite (The Turnpikes intrusion, **MTla**) east of Two Mile Bay is interpreted to be derived from the proximal deformed leuconorite tentatively assigned to the Quarry intrusion. The deformed leuconorite is also intruded, east of Two Mile Bay, by leucotroctolite and olivine-bearing leuconorite (**Mlt, Mltb**), the foliation in the older rock being truncated at outcrop scale.

The Quarry intrusion may be intruded by the South Channel Cairn layered leuconorite–anorthosite (**MSCl**), but the contact was not seen and is assumed to be under the sea east of Meta Cove. The attitude of the two units suggests that the layered South Channel Cairn intrusion dips westward off, and accumulated upon, the foliated Quarry leuconorite. However, rocks of the South Channel Cairn intrusion in the Meta Cove to Southern Point area do have a strong resemblance to the Quarry leuconorite, and the layering is crosscut by a moderately to shallowly dip-

ping foliation, giving compositional and structural grounds for a correlation between the two units. The Quarry leuconorite is intruded by foliated leuconoritic dykes, by foliated and dip-lineated granular ferrodiorite dykes, by dark-green to black magnetite-diorite dykes, and by fresh to chloritized olivine gabbro to diabase dykes.

IGNEOUS ROCKS OF MESOPROTEROZOIC AGE: THE NAIN PLUTONIC SUITE (may include some older rocks)

ANORTHOSITIC INTRUSIONS
(including olivine-bearing types)

This subdivision is a group of rather monotonous leucocratic rocks that includes a broad range of textural and compositional types. Those units that comprise a significant volume of foliated and recrystallized rocks are addressed first in the summary descriptions below. The anorthositic intrusions are subdivided into separate map units, in some cases clearly representing individual intrusions, where aggregated criteria justify it, but boundaries are subject to revision. Inclusions of texturally and mineralogically different rocks can be definitely delineated separately from the host rock in some outcrops (*e.g.*, sharp edged blocks surrounded by a different rock type), but in many cases texturally different parts of outcrops (*e.g.*, pegmatitic bodies of leuconorite in finer leuconorite or anorthosite) have diffuse contacts with more abundant host and could, rather than being older solid blocks, represent either variable nucleation rates within the body, mushy cognate rafts or small contemporaneous intrusions.

M?mflta
Massive to foliated leuconorite, olivine-bearing leuconorite, leucotroctolite and anorthosite

Distribution: This unit encompasses all the streaky-foliated rocks exposed in the Base Island–Sandy Point–Rhodes Island area. It includes rocks in which olivine (mm to 1 x 0.5 m scale) occurs either alone (leucotroctolite) or as cores to orthopyroxene (olivine-bearing leuconorite); olivine, however, has not been recognized in all field exposures of rocks assigned to this unit. In the most olivine-rich rocks orthopyroxene may be present only as an atoll that separates the olivine from plagioclase. Several different intrusions may be represented by this subdivision. There is no implication that all such foliated rocks are the same age, and the unit may, in fact, encompass some Paleoproterozoic rocks. The westward extrapolation of this unit to include leucogabbroic and leuconoritic rocks between Sandy Point and the lower part of Sachem Bay (Webb's Neck) is somewhat conjectural because of limited data.

Characteristics: The foliated olivine leuconoritic to leucotroctolitic rocks underlying northern Base Island are white weathering on the coast, but are somewhat friable and have a red-streaked nature inland. Orthopyroxene, in many places having an abundance of needles and plates of purplish-brown oxide, is locally in excess of, or occurs instead of, olivine; the olivine locally has an orthopyroxene halo, but in many rocks olivine streaks are the dominant trait. Biotite and green-brown hornblende are intergrown with, and form replacement rims on, pyroxene and olivine in most of these rocks. Hornblende is also present locally as twinned, single, isolated grains within

these rocks. Those rocks in the poorly-exposed center of Base Island, as well as similar foliated rocks on the southeast peninsula of the island and on islands in the bay to the east, are interpreted, or seen, to be large inclusions or inclusion-rich regions, comprising rocks equivalent to those on the north shore of the island, suspended within a younger intrusion (The Turnpikes intrusion, **MTla**).

The foliated rocks at the western end of Rhodes Island are anorthosite and leuconorite layered on a centimetre- to metre-scale, having remnants of coarse orthopyroxene and displaying a fabric defined by lozenges and streaks of orthopyroxene. The anorthositic rocks here are granular and recrystallized but they lack a pervasive foliation; a fine-grained, vermicular, subsolidus, myrmekite-like structure is present along some plagioclase boundaries, and is a feature of many NPS rocks. High temperature hydration of the Rhodes Island rocks is manifested in the development of green hornblende rims on orthopyroxene and complete amphibole pseudomorphs of the pyroxene. Secondary alteration is minimal in most rocks of this unit, manifested as chlorite replacement of biotite, bastite replacement of pyroxene, and sericitization (± epidote) of feldspar.

Regional Structure: The foliation in the rocks on the northern part of Base Island has a northerly to northwesterly strike and moderate easterly dip. North–south trends and steep dips characterize those at the west end of Rhodes Island. Foliated rock occurring as small inclusions in massive rock, as well as outcrop areas interpreted as larger inclusions, locally have foliations that are highly discordant to the fabrics of the more coherent unit. With the exception of the rocks at the western end of Rhodes Island and at Webb's Neck, the mesoscopic fabric defined by the mafic mineral(s) present in these rocks is not the Mount Lister 'marginal'-type anastomosing foliation – characterized by variably recrystallized and tailed-out coarser mafic minerals (*see* below) – but rather is a streaky one defined by concentrations of granular pyroxene and olivine.

Stratigraphic Relationships: The foliated rocks are intruded by, and form numerous outcrop-scale rafts within, massive undeformed anorthositic and leuconoritic rocks of the First Rattle intrusion (**MFRa**) in the Topsy Point–Sandy Point sector, as well as in The Turnpikes intrusion (**Mtla**) on Rhodes Island, east of Base Island and along the north shore of Hillsbury Island. The western part of the unit, at Webb's Neck, is interpreted to be intruded by the eastern ferrodioritic margin of the Barth Island composite intrusion (**MBIfd**), but this relationship has not been verified. The unit is also intruded by rare, narrow, pre-foliation 'mafic granulite' (two-pyroxene) dykes, as well as by post-foliation bifurcating black dioritic dykes, medium-grained granitic dykes, pink aplitic granite dykes, grey tonalitic dykes, the Satorsoakulluk ferrodiorite dyke (**MSKfd**), and olivine–diabase dykes.

MUlna

Unity Bay intrusion: Medium- to coarse-grained leuconorite, leucogabbro and anorthosite and foliated equivalents

Distribution: Rocks assigned to this unit are exposed in the vicinity of Nain, extending from Akpiksai Bay to Kauk Harbour. A foliated northern zone is demarcated as a separate subunit (**MUfz**) of the intrusion. The stratigraphic name for the unit comes from the bay on which the town of Nain is located.

Characteristics of the Main Unit: The Unity Bay intrusion comprises medium- to coarse-grained anorthosite, leuconorite, leucogabbronorite and leucogabbro. Weathering colour is pale grey, white, to buff inland, but darker grey on the coast. High temperature recrystallization and annealing of feldspar are evident in many parts of the intrusion, but the pre-recrystallization grain size was generally on the order of 0.5-5 cm. Coarser parts of the unit have plagioclase in excess of 20 cm. Primary plagioclase relics in recrystallized rocks are generally steel grey, but some have a pale mauve cast. Where primary textures are best preserved they vary from seriate (1-10 cm equant to tabular plagioclase) to clotted (irregular oikocrysts of orthopyroxene distributed unevenly throughout outcrop). Sharp compositional layering is lacking, but there are local discontinuous pyroxene-rich layers and lensoid zones. Orthopyroxene is black or dark brown; kinked cleavages are widespread. Where not severely recrystallized the orthopyroxene is as single grains, in some cases oikocrystic. It is in a subophitic relationship with the plagioclase, and is generally less recrystallized than the feldspar. The orthopyroxene locally occurs in schlieric lenses and segregations, where it is accompanied by opaque oxide. Podiform concentrations of pyroxene megacrysts generally comprise multiple individuals, and likely represent antecrystic or xenocrystic masses; elongate aggregates of both the coarse- and fine-grained (recrystallized) types can be in excess of 1 metre in maximum dimension. Magnetite is widespread and usually present in most outcrops, but volumes are quite variable. Local high-temperature hydration, exemplified by green hornblende rims on the pyroxene, accompanied or postdated the recrystallization of these rocks. A pervasive, secondary, low-temperature alteration is manifested as the widespread development of chlorite, actinolite and epidote.

Subunit MUfz
Foliated zone of the Unity Bay intrusion

Distribution: This subunit crops out in the vicinity of Akpiksai Bay and the ridge west of Nain.

Characteristics: The foliated and recrystallized rocks of this subdivision of the Unity Bay intrusion are well-exposed at Akpiksai Bay. The anorthositic rocks have aligned lozenges of plagioclase within a recrystallized matrix (some megacrystic orthopyroxene seems to be less affected, in places maintaining a subophitic form). Leuconoritic rocks have a fabric defined by streaks of recrystallized orthopyroxene (±clinopyroxene). Compositional variations in outcrop imply that the foliation is superimposed upon, and is parallel to, a local pre-existing layering. Orthopyroxene megacrysts present in the foliated rocks are mostly remnants of subophitic ones, perhaps indigenous to the rock or part of attenuated inclusions. The pyroxene is black and has kinked cleavage. It is probable that some of these megacrystic pyroxenes are of the high-alumina type, having fine plagioclase exsolution along their cleavage, because where they have recrystallized, the resulting product is a granular association of orthopyroxene+plagioclase. In common with the undeformed part of the Unity Bay intrusion, this subunit contains rocks exhibiting hornblende overgrowths on pyroxene, indicative of a high-temperature hydration that accompanied or postdated the deformation and recrystallization. Bright-green epidote is a locally prominent mineral in these rocks.

Regional Structure: This subunit has a foliation that strikes east to north of east, and dips steeply to the north. 'Tectonic slides' within the main foliation are oblique to the foliation. Overall, the rocks assigned to this subunit resemble those of foliated margins seen in 'old' NPS intrusions of

the area (*e.g.*, the Mount Lister intrusion to the west, *see* below). If this subunit does represent such a margin here the contact with envelope rocks has been excised by the ferrodiorite of the outer Barth Island composite intrusion (**MBIfd**) and by the Akpiksai Bay leuconorite (**MAln**) that abut it to the north. A prominent hill just west of Akpiksai Bay is underlain by foliated rocks having lensoid mafic layers and a foliation that wraps around inclusions of black leuconorite; though structurally similar, this outcrop area may be exotic with respect to the leuconoritic rocks of the foliated zone of the Unity Bay intrusion.

Stratigraphic Relationships of the Unity Bay intrusion: It is intrusive into the easterly-trending septum of layered mafic rocks (**A?mu**) and quartzofeldspathic gneisses (**Aggl**) along its northern margin. These older rocks are enclosed by the foliated subunit of the Unity Bay intrusion, and the leuconoritic rocks at the contact have a fabric parallel to the trend of the interface between the two. The contact is structurally conformable for the most part, but small folds in the older rocks are truncated. The fact that the older rocks form an elongate belt inside the foliated zone indicates that these rocks do not constitute the actual external envelope to the intrusion but that they may be part of the country-rock that was wedged apart by the intrusion. Inclusions of layered to massive, oxide-rich gabbronoritic rock ('mafic granulite') and pyroxenite in the vicinity of Ship Hill may be derived from layered rocks such as those in the septum, but the lack of olivine in these inclusions renders this interpretation questionable.

The foliated zone of the Unity Bay intrusion has been intruded by massive to weakly deformed leuconorite of the Akpiksai Bay intrusion (**MAln**) west of Akpiksai Bay; the interpretation is based on the map pattern defined by massive versus deformed rocks, as well as by recrystallized anorthositic inclusions within the more pristine body. The foliated zone is also intruded by fine-grained ferrodiorite of the southern margin of the Barth Island composite intrusion (**MBIfd**) to the north of Akpiksai Bay; the contact was not observed but the structural contrast implies that the ferrodiorite is younger. The Unity Bay intrusion is truncated west of Nain by seriate leuconorite of the Hosenbein Lake intrusion (**MHln**). The contact between the two is a broad zone of intrusion breccia; dykes of the Hosenbein Lake intrusion pervade the western edge of the Unity Bay intrusion, and rafts of the older rock abound within the eastern margin of the Hosenbein Lake intrusion. A subhorizontal seriate-textured gabbronorite sheet (**Mgbn**) south of Nain may be distal dyke from the Hosenbein Lake intrusion. The Unity Bay intrusion is assumed to be truncated on its eastern side south of Unity Bay by the South Channel Cairn layered anorthosite and leuconorite (**MSCl**). No contact between these two units has been seen, so both units may be variations of the same pluton. However, the contrasts in the regional aeromagnetic signature south of Unity Bay, as portrayed in the data compiled by Kilfoil (2002), are consistent with the interpretation of two different intrusions here.

Sinuous, black-, to grey- to brown-weathering, gabbronoritic ('granulite') or dioritic dykes, are regionally distributed within the Unity Bay intrusion. These dykes are granular to slightly feldsparphyric, locally exhibit pinch-and-swell structure, and may be foliated parallel to their strike. Their bifurcating aspect implies emplacement along irregular fractures; they clearly cross-cut the deformational fabric of the foliated zone. Stockworks of dark-brown, oxide-sulphide diorite (gabbronorite) dykes and related irregular bodies (**Moxf**) transect the foliated zone of the Unity Bay intrusion west of Akpiksai Bay; some small dykes on the shore of Akpiksai Bay have a tuff-

isitic aspect. A bifurcating network of mineralized (oxide and sulphide), rusty-brown to chocolate-brown dioritic (gabbronoritic) to pyroxenite dykes also occurs within the foliated zone west of the crest of Nain ridge. These rusty dioritic intrusions may be of more than one generation, and they postdate recrystallization and foliation of their host. A 30-m wide foliated gabbronorite dyke cross-cuts the foliation in, and contains rafts of, the foliated zone at the tip of the point on the north side of Akpiksai Bay; the dyke itself has an L>S foliation.

The Unity Bay intrusion is intruded by many granitic dykes, mostly biotite leucogranites, varying from pegmatitic to aplitic, and having widespread development of graphic texture. A variety of trends is apparent among the granitic dykes, but no crosscutting relations between dykes having differing orientations were observed; all such dykes are sharp-walled and seem to postdate the recrystallization of their host. The Unity Bay intrusion is also cut by massive, fine- to coarse-grained, subophitic-textured olivine–diabase and olivine–gabbro dykes and a densely plagioclase–porphyritic dyke (the so-called 'Nain Hill dyke', **dp**; *see* Upton, 1974, p. 133).

MMLa
Mount Lister intrusion: Pegmatitic anorthosite and leuconorite and foliated equivalents

Distribution: This unit underlies all the western part of the map area, stretching from Ugjutoarsuk (Webb's) Bay southward across Nain Bay, and is named for the prominent and imposing mountain to the northwest of Conch Bay. The eastern part of the intrusion comprises foliated rocks that are treated as a separate subunit below.

Characteristics of Main Body: The Mount Lister intrusion comprises white to pale-grey weathering, generally medium- to coarse-grained to pegmatitic, anorthosite to leuconorite. The plagioclase in these rocks exhibits significant fracturing and recrystallization. These characteristics of the feldspar are associated with the development of a penetrative deformational fabric along the margins of the intrusion (*see* below) but in the interior they seem to be simply a result of localized mechanical stresses within the plagioclase crystal pile during emplacement. Some of the best preserved dark grey igneous feldspars, crystals of which are locally in excess of a metre on a side, have blue-green to deep royal blue labradorite schiller. Coarse, kinked, orthopyroxene (in excess of 1 m across) appears to be both intercumulus and exotic in the rock; most, if not all, pyroxene is an intercumulus phase in the pegmatitic parts (where it partly encloses plagioclase and is accompanied by masses of ilmenite and lesser apatite), but of less certain indigenous origin in the finer-grained rocks. The orthopyroxene is locally surrounded by an amphibole+biotite halo, and is generally less recrystallized than the plagioclase.

Regional Structure of Main Body: The Mount Lister intrusion is diffusely layered on a metre- to tens-of-metre-scale. The mesoscopic compositional layering comprises alternating pale grey to white anorthosite to grey leuconorite, best visible on the steep cliffs bounding Nain Bay, Tikkoatokak Bay and Conch Bay. At Conch Bay the layering is easterly striking and north dipping, on the shore south of I' ngergharnia' luk it is northeast striking and southeasterly dipping, and on the south side of Nain Bay it is easterly striking and gently south-dipping. The overall structure of the layering within the intrusion seems, therefore, to be domal. The layering exposed south of I' ngergharnia' luk is regular and continuous over long distances along the cliff, but, when

viewed down dip, the leuconoritic component is discontinuous and podiform. This morphology indicates that the leuconoritic 'layers' are not strictly planar, but rather are disposed as elongate, continuous, pyroxene-rich units (ridges? magma migration paths?) that trend (in this case) down dip.

Subunit MMLfm
Foliated margin of the Mount Lister intrusion

Distribution: This eastern subunit of the Mount Lister intrusion is 2 to 5 km wide in the Ugjutoarsuk Bay–Conch Bay area and 3.5 km wide directly south of Nain Bay, but seems to be narrower, or even absent, farther south (where fewer observations have been made).

Characteristics of the Foliated Zone: This marginal subunit comprises granular, recrystallized, and foliated rocks that separate the interior massive part of the intrusion from the Archean gneisses (**Aggl**) and the associated deformed layered intrusion (**A?mu**). The foliated rocks are separated from country rock east of Ugjutoarsuk (Webb's) Bay and south of Nain Bay by a sheath of massive to foliated fayalite monzonite (**MLfmz**). In spite of the deformation exhibited by the marginal zone, there is local preservation of primary textures and features. The margin seems to have had a compositional layering of anorthosite and leuconorite; this layering is a continuation of that seen in the interior of the body, but is parallel to foliation in the deformed rocks. The fabric in leuconoritic compositions is defined by clusters of ortho- and clinopyroxene locally having a halo of hornblende and biotite; in some rocks the pyroxenes are totally replaced by aggregates of green hornblende. Many deformed anorthositic rocks have no hint of foliation because of annealing, but oriented lozenges of remnant igneous plagioclase may be present.

Regional Structure of the Foliated Zone: The foliated zone is steeply east-dipping east of Conch Bay, and moderately dipping to the east on the south shore of Nain Bay; foliation attitudes east of Ugjutoarsuk (Webb's) Bay have an oblique relation to the trace of the contact between the intrusion and the gneisses but the extent and significance of this relation is unclear.

Stratigraphic Relationships of the Mount Lister intrusion: Several lines of evidence indicate that the Mount Lister intrusion is among the oldest members of the NPS. Outside the map-area, a monzonite abutting, and having the same foliation as, the marginal deformed zone has yielded an age of 1343±3 Ma (Connelly and Ryan, 1994). This monzonite is a continuation of unit **MLfmz** of the present map-area, and its times of emplacement and crystallization are interpreted as being temporally similar to those of the Mount Lister intrusion. The interior part of the Mount Lister intrusion is host to a younger ferrodioritic pluton (the Ukpaume intrusion) dated at 1333±2 Ma (Hamilton *et al.*, 1994), additional evidence that the Mount Lister intrusion is an early member of the NPS. This is also supported by a crystallization age of 1326±1 Ma for a pegmatitic olivine-bearing leucogabbroic dyke cutting the anorthosite on the south side of Nain Bay. Clear intrusive contacts between the Mount Lister intrusion and its envelope are not obvious, the interface being a structurally conformable one having foliated rocks on both sides. The foliated margin (subunit **MMLfm**) of the Mount Lister intrusion indicates that the contact between the intrusion and the gneissic envelope has been the site of significant deformation. This zone is considered a conse-

quence of emplacement-induced shear between two rock types that were essentially solid at time of juxtaposition.

The Mount Lister intrusion has been penetrated by several younger plutons. It is intruded by seriate leuconorite (**Msln**) along its eastern side to the southwest of Sachem Bay, the relationship being demonstrated by fragments of foliated leuconorite and recrystallized anorthosite in the seriate textured rock, as well as the regional contrast between the foliated and recrystallized Mount Lister rocks and the fresh undeformed leuconorite to the east. Massive leucotroctolite and olivine-bearing leuconorite (**Mtlt**) crosscut the Mount Lister intrusion east of Tessiujâtsuk; the contact has not been directly observed, but the interpretation of relative ages is reasonable on geological grounds, *e.g.*, truncation of layering, degree of recrystallization. The apparent disappearance of the foliated margin towards the southern part of the map-area between Nain Bay and Tessiujâtsuk may be an indication that another intrusion, superficially similar to the Mount Lister, is present there.

The Mount Lister intrusion is intruded also by a variety of dykes. Among these are massive to foliated and coarse-grained to allotriomorphic granular dykes, especially granular gabbronoritic ('granulitic') and composite basic - silicic (gabbronoritic - granitic) types, in the region of Mount Lister and Nain Bay; many such dykes are subhorizontal. These dykes crosscut the layering and foliation of their host, but are themselves foliated, seemingly by syn-emplacement, wall-parallel shearing. Subparallel brittle fractures within the Mount Lister intrusion on the south shore of Nain Bay west of Kaiktusuak Point are occupied by coarse-grained to pegmatoidal, olivine-bearing, zircon-rich, leucogabbroic or leucodioritic dykes, one of which yielded a U–Pb (zircon) crystallization age of 1326±1 Ma. Several, nonfoliate, northwest-striking monzonitic dykes (Kaiktusuak dykes, **MKm**) crosscut the intrusion on the south side of Nain Bay; these dykes cross the foliation in their host at a high angle and are not deformed. Coarse-grained olivine gabbro dykes are present in the intrusion south of I' ngergharnia' luk and south of Nain Bay.

M?mlna
Massive to weakly layered, locally foliated, white (recrystallized) and mauve-grey (nonrecrystallized) anorthosite and leuconorite

Distribution: This is a unit of unknown age and extent, north of the east–west-trending layered mafic and ultramafic rocks, that is well exposed on the southeastern, eastern and northern flanks of the eastern part of Nain ridge, west of the airstrip.

Characteristics: The rocks of this unit vary from crystalline and granular/granoblastic to igneous textured, and include massive grey to mauve anorthositic and leuconoritic rocks having subophitic orthopyroxene over 10 cm in size. The rocks on the lower levels of the ridge also include massive, black-weathering, 'salt-and-pepper'-textured gabbronorite having plagioclase megacrysts, as well as diffusely layered and weakly foliated brownish gabbronoritic to leuconoritic varieties. The diffusely layered rocks are gradational upwards into pale grey to white, granular to igneous-textured leuconoritic rocks having granular pyroxene streaks, orthopyroxene megacrysts, local pale blue labradorite plagioclase, and inclusions of pegmatoidal leuconorite and white anorthosite. Epidote and chlorite are present as secondary alteration of the plagioclase and pyroxene.

Stratigraphic Relationships: This unit has an exposed, slightly transgressive, intrusive contact against the northern edge of the sequence of layered ultramafic, mafic and associated rocks (**A?mu**) along the ridge northwest of Nain. The nature of the contact between this unit and the Unity Bay intrusion has not been determined; it is possible that this unit is a variation of the Unity Bay intrusion, but if so it is a rock type that is peculiar to this one area. There is some evidence, however, to indicate that the Unity Bay intrusion was emplaced after the precursor magma to the mauve anorthositic rocks had intruded the layered sequence. This relative relation is predicated on the observation that white leuconorite assigned to the foliated subunit of the Unity Bay intrusion (**MUfz**) forms sheets within, and contains inclusions of, the granular mauve leuconorite just west of the Nain airstrip. Massive olivine gabbro dykes and a densely feldsparphyric mafic dyke (the 'Nain Hill dyke', **dp**) intrude this unit on the ridge northwest of Nain.

MAln

Akpiksai Bay intrusion: Massive to weakly foliated leuconorite, leucogabbro and anorthosite, having a fairly uniform distribution to the orthopyroxene

Distribution: This unit forms as an east–west elongate body west of Akpiksai Bay (for which it is named), but its extent has not been fully defined.

Characteristics: This intrusion comprises largely a medium-grained leuconoritic rock, having a 2–5 cm grain size, a fairly uniform distribution of its interstitial orthopyroxene, and rare dark gray plagioclase megacrysts. A massive to mildly foliated nature has been used as a criterion to distinguish it from the proximal rocks assigned to the Unity Bay intrusion, the latter being generally strongly deformed. Undeformed rocks of this unit are distinguished from those of the Unity Bay intrusion by their overall higher volume of pyroxene and its more even distribution; in the Unity Bay intrusion the pyroxene is usually present as separate spongy areas producing a 'clotted' texture. Orthopyroxene, some of which has oxide plates and needles, is the predominant pyroxene of the Akpiksai Bay intrusion, but clinopyroxene is also present. Actinolite, chlorite, and epidote are secondary replacement minerals of the primary igneous assemblage, and in many rocks very little primary mafic mineral remains.

Stratigraphic Relationships: The Akpiksai Bay intrusion has been emplaced into the belt of Archean(?) layered mafic, ultramafic and mesocratic rocks (**A?mu**) west of Akpiksi Bay; fragments of the older rock are present locally. The map pattern and a consideration of differences in deformation indicate that the Akpiksai Bay intrusion truncates the continuity of the foliated part of the Unity Bay intrusion (**MUfz**). Inclusions of 'foliated margin'-type rocks occur at several locations near the postulated interface, but folds of fabrics in some fragments, coupled with the lack of large orthopyroxene and plagioclase relics, make the correlation with the foliated part of the Unity Bay intrusion suspect because the latter does not have folded foliations; a subrounded recrystallized white anorthosite inclusion near the contact just west of Akpiksai Bay is a good candidate for derivation from the abutting intrusion, even if the polydeformed foliated rocks are not. The Akpiksai Bay intrusion is cut by the fine-grained ferrodiorite of the southern margin of the Barth Island composite intrusion (**MBIfd**) west of Akpiksai Bay. Oxide-rich ferrodioritic sheets (**Moxf**) crosscut the unit west of Akpiksai Bay, and it is transected by granitic dykes and by a densely plagioclase–porphyritic gabbro dyke (the 'Nain Hill dyke', **dp**).

MSCl

South Channel Cairn intrusion: Layered to massive leucogabbro, leuconorite and anorthosite

Distribution: This unit occupies the area south of Unity Bay between Mount Sophie and the coast to the east, and is named for the hill within it north of Meta Cove.

Characteristics: The South Channel Cairn intrusion comprises pale grey, pale brown, and white leucogabbro, leuconorite and anorthosite, having a seriate to blotchy poikilitic ('clotted') texture, but locally exhibiting significant recrystallization. Grain size is generally 2–5 cm, having plagioclase and orthopyroxene megacrysts widely distributed. Plagioclase is locally bordered by a plumose vermicular myrmekite-like structure, and some orthopyroxene in the layered rocks contains plates and needles of oxide. A green hornblende encases the pyroxene in some leuconoritic rocks, and magnetite is locally abundant. The rock types of this intrusion constitute a well-developed layered series (0.5–2 m thick layers), gently inclined towards the west or northwest, near Mt. Sophie, in the vicinity of South Channel Cairn, and along the coast between Southern Point and Kauk Harbour. The layering generally has diffuse contacts between the differing compositions; 'compacted' orthopyroxene locally defines a crude layer-parallel foliation. Labradorite schiller, comparable to that exhibited by feldspar in the Quarry leuconorite (**P?Qln**), is present along the coastal part of this unit south of Southern Point. Greenschist-facies alteration is evident by the development of actinolite, chlorite, and epidote.

Regional Structure: The compositional layering evident in this unit indicates it is disposed as a northerly-trending slab-like body that is gently inclined to the west. Along the coast near Meta Cove there is a locally developed foliation oblique to the compositional layering; this foliation has a similar orientation to that in the Quarry intrusion (**P?Qln**) to the east.

Stratigraphic Relationships: The designation of this layered body as a separate intrusion is equivocal; no contacts were observed with any of the proximal units. The premise is based on its layered character and on the observation that there is a geophysical contrast, specifically in aeromagnetic signature (apparent on Geological Survey of Canada regional maps), with the Unity Bay intrusion (**MUlna**). Elongate slab-like inclusions of anorthosite (derived from the Unity Bay intrusion??) are present near the South Channel Cairn.

The South Channel Cairn intrusion is assumed to intrude and sit atop the Quarry intrusion (**P?Qln**), but two features suggest that there could be continuity between them. The similarity between the labradorite-bearing rocks of both units could be used as a basis for this correlation. In addition, the foliation evident in the South Channel Cain intrusion between Southern Point and Kauk Harbour matches that of the Quarry intrusion of the Riflesight Hill area directly east. One implication of this is that both units are part of the same intrusion and have been affected by a common deformational event — the South Channel Cairn unit being a layered succession overlying the massive Quarry leuconorite. A possible correlation between these two units would dictate a revision in the assumed stratigraphic relationships with some of the rocks they abut (for example, the South Channel Cairn intrusion could be older than the Unity Bay intrusion).

The South Channel Cairn intrusion is crosscut by brown, granular, foliated 'ferrodiorite' (oxide-rich gabbronoritic) dykes, by white to pink granitic dykes and by olivine gabbro and diabase dykes.

MHln

Hosenbein Lake intrusion: Brownish-weathering leuconorite, massive olivine gabbro (subunit* MHg*), and grey-weathering clotted- to seriate-textured leuconorite and leucogabbronorite; also includes an oxide-rich subunit (*MHlno*) along its northern margin

Distribution: This unit is an elongate south-southeast-trending intrusion extending from the shore of Nain Bay southward across Hosenbein Lake (for which it is named).

Characteristics: The Hosenbein Lake intrusion, as defined here, exhibits north-to-south and west-to-east variations in composition and texture. The northern part is dominantly brownish-weathering oxide-rich leuconorite and gabbronorite (subunit **MHlno**) containing dark grey plagioclase crystals. These oxide-rich rocks may be part of a separate intrusion because they are mesoscopically similar to coarser parts of ferrodioritic units within the map area, and locally contain zircon. The western margin of the Hosenbein Lake intrusion is locally characterized by a medium-grained, biotite-bearing, olivine–gabbro or clinopyroxene–troctolite (subunit **MHg**). Northwest of Hosenbein Lake the olivine-bearing rocks pass eastward into a rather uniform clotted-textured (blotchy poikilitic) leuconorite. Within this part of the intrusion there are centimetre- to tens-of-metre-scale inclusions of recrystallized and foliated anorthosite and leuconorite (having orthopyroxene as undeformed masses and as a foliation-forming mineral) that appear to have been derived from the Mount Lister intrusion (**MMLa, MMLfm**). The massive rocks are gradational farther eastward (stratigraphically upwards) into well-layered, clotted-textured rocks having rafts of foliated leuconorite and recrystallized anorthosite. The layering is lensoid, on the scale of tens of centimetres to a couple of metres thick, and strikes northwest and has a northeast dip. The rafts in the layered sequence are interpreted as fallen or stoped blocks derived from the Unity Bay intrusion (**MUlna**); such blocks appear to have settled rather passively into the layered crystal mush, and the largest ones have orthopyroxene nucleated along the lower edge. The layered rocks are further overlain by a seriate-textured leuconorite. This leuconorite contains many, variable-sized, rafts of the Unity Bay intrusion; magnetite-bearing pyroxenite and hornblende-rich diorite dykes in the rafts are absent from the seriate-textured host, indicating that these dykes predate the Hosenbein Lake intrusion. Plagioclase throughout most of the Hosenbein Lake intrusion is white to pale grey to steel-blue-grey, and locally has a blue labradorite schiller. It locally exhibits myrmekite-like vermicular intergrowths along its borders, and some grains are choked with translucent purplish plates and needles of Fe–Ti oxide. Orthopyroxene in the northern subunit displays complex microscopic exsolution textures, compatible with derivation by pigeonite inversion, and both it and the lesser clinopyroxene locally have a rim of green hornblende. Secondary minerals replacing the primary ones include actinolite, chlorite, epidote, and sericite, but this alteration is not regionally pervasive. A granular, pitted-weathering, leuconorite to leucogabbro unit on the 600-foot hill south of Pikalujak kangidlua is tentatively included within the Hosenbein Lake intrusion and is shown as an extension of one of the northern zones on the map. This rock, which exhibits varying degrees of recrystallization, interfingers with the uppermost seriate part of the Hosenbein Lake intrusion in this area. It differs from adjacent rocks assigned to the Hosenbein Lake intrusion by

the presence of a weak foliation and post-foliation sinuous 'mafic granulite' dykes, features which could be cited as entirely negating its assignment to the Hosenbein Lake body.

Regional Structure: The Hosenbein Lake intrusion seems to be an easterly inclined laccolith, having a floor of gneisses and a roof composed predominantly of Unity Bay intrusion. The brownish-weathering, oxide-enriched northern part of the intrusion may be one of the side walls. The abundance of large inclusions in the southern part of the intrusion implies that it plunges southeast underneath the Unity Bay intrusion or that roof collapse of the older rock was more extensive there than to the north. Except for the weak foliation in rocks exposed south of Pikalujak kangidlua, the Hosenbein Lake intrusion lacks any deformational features.

Stratigraphic Relationships: The Hosenbein Lake intrusion has been emplaced into granulite-facies quartzofeldspathic gneisses (**Aggl**) and layered ultramafic to mesocratic rocks (**A?mu**) that abut it on the western and northeastern margins. Along the northwestern edge it forms sheets within the quartzofeldspathic gneiss. On its western side the lowermost unit of olivine-bearing gabbroic rock is in sharp contact with, and dips moderately eastward off, both the quartzofeldspathic and layered mafic rocks. Along its eastern side the Hosenbein Lake intrusion has punctured the Unity Bay pluton (**MUlna, MUfz**), the contact zone being a broad area of intrusion breccia. It may also be intrusive into the Mount Lister anorthosite and leuconorite (**MMLa, MMLfm**) below the current erosion level; inclusions of foliated and massive, coarse-grained, leuconorite and anorthosite resembling rocks of the Mount Lister intrusion are locally abundant near its western and northwestern margins. Northeast-striking granitic dykes are present within the Hosenbein Lake intrusion, but the paucity of granitic dykes here contrasts with their greater abundance and diverse attitude in the nearby Unity Bay intrusion. East–west striking (chloritized) olivine diabase dykes, as well as an 8-km-long northwest- to north-striking one, cut the Hosenbein Lake intrusion.

MFRa
First Rattle intrusion: Massive grey-weathering anorthosite and leuconorite

Distribution: This intrusion underlies the coastline of First Rattle and extends north through Itilialuk Peninsula and south through Sakotalik Summit.

Characteristics: The First Rattle intrusion comprises massive pale grey to dark grey anorthosite and leuconorite, having varying volumes of dark grey to black plagioclase crystals that locally show a preferred orientation having a predominantly north-northeast to northeast trend. The weathered surface of anorthosite within this intrusion has a widespread netlike pattern resembling cracked glazing on pottery (crazing), a reflection of irregular to plumose, myrmekite-like structure and alteration along feldspar grain boundaries. Dark grey leuconorite, locally crumbly and having olivine within the core of the orthopyroxene, occurs along the eastern part of the intrusion between Itilialuk Hill and Sandy Point. There seems to be a correlation within this intrusion between the presence of olivine in the host (orthopyroxene-bearing leucotroctolite) and olivine-bearing (leucotroctolitic) inclusions, but the significance of this relationship is unclear. Clinopyroxene is locally present as narrow networks between plagioclase grains within this unit. A dark-green to blue-green amphibole is locally present, and chlorite and sericite are widely developed. Biotite is particularly noticeable along the contact with the troctolite north of Sachem Bay.

Stratigraphic Relationships: The First Rattle intrusion contains numerous inclusions of foliated leucotroctolite and olivine-bearing leuconorite between Topsy Point and Sandy Point, perhaps derived from foliated rocks (**M?mflta**) to the east. It has intruded the Tikkiraluk Hill troctolite (**MTtr**) at the entrance to Sachem Bay, and is assumed to intrude recrystallized anorthosite and leuconorite (**Mla1**) on Itilialuk Peninsula, and mottled leuconorite (Halfway Point intrusion, **MHPln**) through Sachem Bay. The First Rattle intrusion may be the youngest anorthositic intrusion in the area because, with the exception of diabase and granitic dykes, the map pattern implies that it is transected only by ferrodiorite of the Barth Island composite intrusion (**MBIfd**) and the Satorsoakulluk ferrodiorite dyke (**MSKfd**).

MTla

The Turnpikes intrusion: Massive, grey-weathering, locally olivine-bearing, leuconorite and anorthosite

Distribution: This unit includes all the massive rocks stretching from Base Island, through Kruger Kop Island, The Turnpikes (for which it is named), Rhodes Island, Hillsbury Island, to Paul Island. It likely encompasses more than one intrusion, but is treated as a single entity here.

Characteristics: The Turnpikes intrusion is composed predominantly of white, pale grey, brownish-grey to mauve-grey anorthosite and leuconorite. Seriate texture is evident in the most pyroxene-rich rocks. Leucocratic rocks in which olivine seems to be the dominant mafic silicate are present in the Nixon Hill area of Base Island. The grain size of the rocks within The Turnpikes intrusion varies from medium to very coarse grained (local feldspars up to 30 cm). There is some recrystallization of the feldspars, but it is not widespread; many feldspars, especially in the darker rocks, are clouded by fine needles of Fe–Ti oxide. Dark grey plagioclase megacrysts are widely distributed; local blocks of disaggregated dark anorthosite and leuconorite in some outcrops indicate that these inclusions contributed to the crystal population. With few exceptions, the preferred orientation of feldspar megacrysts in rocks assigned to this unit is slightly north of east. A rarely developed layering in parts of the Turnpikes intrusion mirrors the trend of the feldspar megacrysts, and most dips shallowly and moderately to the north. A yellowish-green labradorite schiller to the feldspars on both sides of Shoal Tickle and on one of the islands east of Base Island may be a feature peculiar to this intrusion. Orthopyroxene megacrysts, both as isolated individuals and as trains of many crystals, are locally present. Both the 'exotic' orthopyroxene megacrysts and subophitic indigenous coarse orthopyroxene (in places being strongly pleochroic and exhibiting exsolution features of an inverted pigeonite) locally have a core of olivine, and plates of (exsolved?) mauve oxide are present in many pyroxenes. In some rocks a vermicular array of oxide forms a 'fingerprint' structure within the orthopyroxene and is the only indication of earlier olivine. Many rocks have a trace of green hornblende and lesser biotite as rims on pyroxene and on opaque oxide, and many plagioclase grain boundaries are characterized by plumose and bulbous 'myrmekite' as in some other NPS intrusions.

Stratigraphic Relationships: The outline of rocks assigned to The Turnpikes intrusion truncates the southward continuity of the foliated rocks (**M?mflta**) of northern Base Island, and there is a clear intrusive relationship between the two units. Several outcrops of foliated rocks through the poorly exposed central part of Base Island seem to represent a large raft within the massive rocks

of this unit (with foliation at a high angle to main unit to the north), and foliated inclusions are also present on the islands in the bay east of Base Island. Inclusions of foliated olivine-bearing leuconoritic rocks are present on southeastern Base Island and the northern shore of Hillsbury Island. An abundance of granular foliated leuconoritic inclusions characterizes The Turnpikes body through eastern Rhodes Island and also rocks assigned to this body northeast of Two Mile Bay, probably derived from proximal foliated rocks. One large raft of layered rocks, including granular leuconorite and olivine-melagabbronorite, derived from The Bridges sequence (**P?BI**) occurs east of Two Mile Bay. A raft of massive leucotroctolite of unknown affinity is present on the larger of The Turnpikes islets. Inclusion-bearing rocks assigned to The Turnpikes intrusion underlying Tun' nuliksoa' kh on Paul Island are interpreted to be intruded by leucotroctolite (**Mlt**), the inclusion-bearing leuconorite seeming to be a large roof pendant in the olivine-bearing rocks. The Turnpikes intrusion is transected by pink granitic dykes, grey granitic dykes, olivine diabase dykes and Satorsoakulluk ferrodiorite dykes (**MSKfd**).

Msln
Seriate-textured leuconorite

Distribution: This unit occupies the highland area southwest of Sachem Bay.

Characteristics: The rocks assigned to this unit are for the most part grey-mottled leuconorite, locally having a rusty patina. The intrusion is regionally characterized by large, blocky, dark grey plagioclase grains (including 10–15 cm megacrysts) surrounded by a paler grey to white, somewhat granular (slightly recrystallized) matrix having subophitic orthopyroxene. Some megacrysts have conspicuous white hairline fractures. The unit displays clotted (blotchy poikilitic) texture, having a weak elongation (streakiness) adjacent to contacts with some older rocks. Plagioclase is generally clouded by needles and dusty granules of opaque oxide. Intensely pleochroic orthopyroxene has a blebby clinopyroxene exsolution and abundant purplish-brown oxide plates.

Stratigraphic Relationships: The seriate leuconorite is intruded into, and has disrupted the continuity of, the layered ultramafic to anorthositic Archean (?) rocks (**A?mu**) west of Sachem Bay. Inclusions of foliated leuconorite and anorthosite support an intrusive relation into the eastern margin of the Mount Lister intrusion (**MMLfm**), and the map pattern indicates that it also truncates the southern continuity of the foliated monzonite sheath proximal to the Mount Lister intrusion (**MLfmz**) but no inclusions of monzonite were observed. The distribution of older rocks indicates the layered mafic and ultramafic rocks (**A?mu**) on the western side of the leuconorite sit topographically above the intrusion and form the roof to it; the monzonite and recrystallized anorthosite and leuconorite abutting it to the west are similarly part of a roof to the intrusion. It is assumed to be intruded by, and form part of the northern wall to, oxide-rich, coarse gabbronoritic and finer ferrodioritic rocks of the Barth Island composite intrusion (**MBIfd**). It is also assumed to be intruded by the Sachem Bay ferrodiorite (**MSfd**). The contacts with these assumed younger units have not been directly observed. The seriate leuconorite may be intruded by the mottled leuconorite (Halfway Point intrusion, **MHPln**) abutting it to the east. The contact between the two is rather diffuse; hence, the relative relationship is based on map pattern and on the interpretation that the Sachem Bay ferrodiorite (**MSfd**) temporally intervenes between the two.

MHPln
Halfway Point intrusion: Mottled to clotted-textured leuconorite

Distribution: This unit is located directly south of Sachem Bay.

Characteristics: This unit is defined mainly on the basis of field appearance, comprising a leuconorite in which orthopyroxene is distributed mostly as isolated, irregular to somewhat oval, poikilitic individuals ('clotted' texture) giving rise to an overall mottled aspect to outcrops. The colour mottling is well displayed by outcrops where the pyroxene is chloritized. Some rocks have a trace of green hornblende, and plumose myrmekite-like intergrowths (of quartz and feldspar?) characterize some feldspar boundaries. The secondary minerals are chlorite, sericite, epidote and carbonate.

Stratigraphic Relationships: No contacts with any surrounding units were observed. The Halfway Point intrusion is assumed to be younger than the seriate leuconorite (**Msln**) to the west, but where the contact between the two was examined south of Sachem Bay the passage from one textural type to the other is very subtle. The map pattern can be interpreted to indicate that the Halfway Point leuconorite is younger than both the Tikkiraluk Hill troctolite (**MTtr**) and the Sachem Bay ferrodiorite (**MSfd**); no contacts were directly observed. It is assumed to be intruded by the First Rattle pluton (**MFRa**), the contact between them passing through the south arm of Sachem Bay, but both units may be part of the same intrusion. The disposition of the mottled leuconorite of the Halfway Point intrusion and the coarse gabbronoritic and ferrodioritic rocks assigned to the Barth Island composite intrusion (**MBIfd**) suggests that the Halfway Point intrusion is part of the country-rock forming the northern wall to the Barth Island composite intrusion. The contact between these two intrusions is, however, not sharp, the subdivision being made on textural grounds rather than on an intrusive relationship.

Mla1
Massive white- to pale grey-weathering anorthosite and leuconorite

Distribution: This unit is exposed though the central part of the Itilialuk Peninsula.

Characteristics: The rocks assigned to this unit are medium-grained to pegmatoidal (20 cm plagioclase), white-weathering, generally uniformly subophitic-textured, variably recrystallized anorthosite and leuconorite. Zones of darker feldspar megacrysts have a consistent southeast trend. Locally there are intercumulus combinations of olivine, orthopyroxene, and opaque oxides. Several sulphide gossans (tens of square metres in size) are present in this unit, seemingly developed over interstitial pyrrhotite (*see* NOTES on map-sheet). Plagioclase in some rocks of this unit displays subsolidus, plumose 'myrmekitic' intergrowths along its margins. The orthopyroxene has plates of purplish oxide, and green hornblende and associated biotite surround and totally replace some of the pyroxene.

Stratigraphic Relationships: This unit contains rafts of foliated leuconorite, probably derived from rocks like those exposed on northern Base Island (**M?mflta**). It is assumed to be intruded by troctolite of the Port Manvers Run intrusion (**MPMlt**) to the east and by massive dark grey anorthosite

of the First Rattle intrusion (**MFRa**) to the west. No contacts between this unit and the aforementioned intrusions were seen, but the interpretation is reasonable based on the characteristics of each unit. It is possible, however, that this unit is part of the First Rattle intrusion, but the difference in plagioclase orientation and the differing degrees of recrystallization point to separate intrusions. Several pink to white granitic (aplite, pegmatite) dykes locally crosscut this unit.

Mla2
Massive, white to pale-grey-weathering anorthosite, leuconorite, and leucogabbro

Distribution: This unit is exposed at the eastern end of Barth Island; designation of rocks in this area as a single intrusion is not firm.

Characteristics: This unit comprises variably recrystallized anorthosite, leuconorite and leucogabbro. Grain size is mostly on the order of 1 cm, but plagioclase megacrysts up to 40 cm in length are locally present. Unlike the similar rock at Itilialuk Peninsula (**Mla1**), no preferred alignment to feldspar megacrysts is apparent. Orthopyroxene is generally present and is locally poikilitic, but in some rocks clinopyroxene is the sole mafic mineral. Olivine is rare or absent, noted only in irregular pegmatitic parts of one outcrop, associated with orthopyroxene and magnetite. Thin rims of green hornblende surround some pyroxenes, and plagioclase boundaries are characterized by plumose myrmekite-like structure. Epidote and chlorite are locally prominent.

Stratigraphic Relationships: This unit forms the floor to west-dipping ferrodiorite of the eastern margin of Barth Island composite intrusion (**MBIfd**), and it is intruded by the Satorsoakulluk dyke (**MSKfd**). Several diabase and granitic dykes transect the unit.

TROCTOLITIC INTRUSIONS

(includes the Barth Island troctolite as well as all other rocks in which olivine is a modally important mineral over a wide area)

This is a texturally diverse group of generally massive rocks in which the grain size varies between fine grained and pegmatitic. Each of the outlined units seems to be an individual intrusion, or part of such, and these intrusions may record protracted, yet episodic, emplacement of magmas from which olivine was the predominant mafic mineral to crystallize.

MBIt
Grey-green to brown troctolite and olivine gabbro of the Barth Island composite intrusion

Distribution: This troctolitic unit forms a fault-offset, ring-shaped, body extending from the south shore of Nain Bay across the eastern and western parts of Barth Island to the north shore of Nain Bay.

Characteristics: The troctolite subdivision of the Barth Island composite intrusion encompasses pale greyish-green to reddish-brown-weathering, fine- to medium-grained leucotroctolite, troctolite, and olivine gabbro. It is generally devoid of sharply defined layering, but has diffuse and discontinuous compositional variations in places (*e.g.*, south shore of Nain Bay, east end of Barth

Island); irregular pyroxenite segregations are locally present (*e.g.*, north shore of Nain Bay). Olivine, seemingly of both cumulus and post-cumulus origin, locally has a narrow halo of orthopyroxene, the latter mineral also having a poikilitic habit in places. Intercumulus clinopyroxene is locally choked with cleavage-oriented plates and rods of opaque oxide. Biotite and brown hornblende are widely distributed, seeming to be most prominent adjacent to granitic rocks. Networks of dark, hairline, actinolite+epidote veins within the troctolite on eastern Barth Island have marginal development of green spinel.

Stratigraphic Relationships: The Barth Island troctolite comprises one ring-shaped unit of a composite intrusion roughly centered on Barth Island. The troctolitic rocks are bounded both internally and externally by other members of the composite intrusion. The contacts between the troctolitic rocks and the abutting rocks within the Barth Island composite intrusion are ambiguous and conflicting, probably reflecting the close temporal relationship between all the rocks within the intrusion:

i) The interface between the troctolite and the underlying monzonite (**MBIfmz**) south of Nain Bay is sharp, and both the attitude of the contact and the weak layering in the troctolite are parallel to the foliation in the monzonite. A thin veneer of fine-grained gabbronoritic rock above the monzonite, having an abundance of inverted pigeonite and locally containing olivine and numerous zircon, marks the actual contact, and appears to be gradational into the troctolite. Troctolite above the monzonite has numerous irregular and anastomosing, aplitic, charnockitic (orthopyroxene-bearing alkali feldspar granite) dykes (not equivalent to the tabular biotite-bearing aplitic granitic dykes so widespread in the region - *see* "Minor Intrusions").

ii) The contact between monzonite (**MBIfmz**) and troctolite at the west end of Barth Island is one where angular rafts of amphibolitized, biotite-bearing troctolite are enclosed by the granitic rock, and straight-walled granitic dykes transect the troctolite.

iii) Along the northwest margin of the Barth Island composite intrusion north of Nain Bay the troctolite is in sharp contact with ferrodioritic and hybrid rocks (**MBIfd**). The foliation attitudes in the ferrodiorite and hybrid group are truncated in map-view by the massive troctolite, implying that the troctolite abuts previously deformed rocks.

iv) The troctolitic rocks are assumed to be intruded by the coarse ferrodiorite (**MBIfd**) through the centre of Barth Island, but the contact was not observed. There is an intrusive relationship of this type, however, on the small island to the north of Barth Island, where a coarse oxide-rich ferrodiorite forms a dyke within the troctolite.

MTtr
Tikkiraluk Hill intrusion: Fine- to medium-grained troctolite and olivine gabbro

Distribution: This unit underlies the northern shore entrance of Sachem Bay and extends northward to Tikkiraluk Hill (for which it is named).

Characteristics: The rocks of this intrusion are fine- to medium-grained, superficially similar to the troctolite subdivision of the Barth Island composite intrusion. Troctolite and olivine gabbro are

the predominant compositions, but serpentinized peridotite is present along the contact southwest of Webb's Point. The unit is generally massive, but there is a shallowly inclined layering along its southwestern margin, and variably oriented ductile shear zones occur on the coast south of Webb's Point. Irregular segregations and veins of pyroxene are present in the troctolite at the entrance to Sachem Bay. Orthopyroxene atolls on olivine are not widely developed in the Tikkiraluk Hill troctolite, but some plagioclase-olivine interfaces have a vermiform orthopyroxene developed along them. Poikilitic orthopyroxene is locally conspicuous in outcrop, and both it and an oxide-choked poikilitic clinopyroxene enclose the olivine. Biotite occurs throughout but is especially noticeable adjacent to granitic rocks west of Tikkiraluk Hill, and brown hornblende is locally present.

Stratigraphic Relationships: It is intruded into, and sits atop gneisses (**Aggl**) on its northern side. It cuts across granitic rocks (**MSgr**), probably part of the Sachem Bay ferrodiorite intrusion, on its northwestern and western margins, but may be only slightly temporally separated from them (*see* section on Granitic Rocks). The assumption of slightly younger and partly mingled relation between the Tikkiraluk Hill intrusion and the abutting granitoid rocks is predicated on observations along the western margin of the intrusion where troctolite and orthopyroxene–poikilitic olivine gabbro pass stratigraphically downward through finer-grained olivine gabbronorite into olivine-free granular gabbronorite having quartz xenocrysts where it is contact with the granite. The Tikkiraluk Hill intrusion is assumed to be emplaced into the Sachem Bay ferrodiorite (**Msfd**) as well; a direct contact with the ferrodiorite has not been seen, but the younger age of the troctolite seems to be a reasonable conclusion based on the map pattern and the aforementioned contact with granitic rocks associated with the ferrodiorite. The troctolite is intruded by grey leuconorite of the First Rattle intrusion (**MFRa**) at the entrance to Sachem Bay; the contact between the two rocks is lobate rather than angular, as if the troctolite was not completely solidified at the time the leuconorite was intruded. At the contact there are leuconorite veins in the troctolite, and orthopyroxene in these veins extends across the margins of the veins to poikilitically enclose minerals of the troctolite. The Tikkiraluk Hill troctolite may also be intruded by the Halfway Point mottled leuconorite (**MHPln**); the contact between these two units has not been observed, but the projection of surmised contacts into Sachem Bay produces a map pattern that could be interpreted to indicate the troctolite is the older of the two.

MPMlt
Port Manvers Run intrusion: Dark-grey to black leucotroctolite

Distribution: Rocks proximal to the coast in the Challenger Cove area are assigned to this unit, which forms a more extensive intrusion to the east and north (*see* Wiebe, 1983).

Characteristics: This unit has been examined in reconnaissance fashion only. In the map area it comprises medium- to coarse-grained, dark grey to black troctolite, olivine leuconorite and leuconorite. Plagioclase has an abundance of dusty opaque oxide inclusions, and olivine exhibits both cumulus and intercumulus habit. Some olivine is surrounded by an atoll of orthopyroxene, and in some cases is partly replaced by the pyroxene which exhibits an internal symplectite of oxide ('fingerprint' structure). Brown hornblende surrounds some olivine. Leucogabbroic rocks underlying the hill directly north of Challenger Cove, and included here within the Port Manvers Run intrusion, are unusual among the plutonic rocks of the Nain area in that they display 'warts' of opaque oxide having pale green hercynitic inclusions and pyroxene haloes.

Stratigraphic Relationships: Zircons extracted from irregular quartz–hornblende–feldspar–apatite segregations within the troctolite north of Challenger Cove indicate a magmatic crystallization age of 1309±1 Ma. The map pattern implies that the Port Manvers intrusion was emplaced into granulite-facies Archean gneisses (**Aggl**), Paleoproterozoic(?) metagabbroic rocks (**P?gbn**), and Mesoproterozoic recrystallized anorthositic rocks (**Mla1**) in the Challenger Cove–Itilialuk Peninsula area, but no direct contacts were observed.

Mlt

Leucotroctolite, troctolite, and orthopyroxene-bearing troctolitic rocks, having along their western side a reddish-brown troctolite (subunit* Mltb*)

Distribution: This unit occurs east of Two Mile Bay and underlies the northern shoreline of Paul Island. Grey leucotroctolite, leuconorite and anorthosite occupying the southern part of Hillsbury Island are assumed to be a continuation of this unit, but are paler in their weathering colour than the rocks on Paul Island.

Characteristics: Most of the inland part of the unit east of Two Mile Bay is a dark grey, friable, orthopyroxene-bearing leucotroctolite, olivine-bearing leuconorite and olivine anorthosite. Plagioclase is on the order of a few centimetres to a few tens of centimetres. Olivine locally has an orthopyroxene rind and the orthopyroxene has olivine cores. In rocks without olivine, the orthopyroxene displays the oxide 'fingerprint' structure indicative of olivine replacement, a feature in common with parts of other olivine-bearing, or formerly olivine-bearing, anorthositic NPS rocks addressed above. Textural considerations imply olivine was a cumulus mineral, subsequently overgrown and replaced by the intercumulus orthopyroxene. The westernmost part of unit on Paul Island is interpreted as a dyke (*see* also Wiebe, 1990), but the contact between it and the leuconorite to the west is diffuse. The dyke has within it zones (designated as subunit **Mltb**) comprising a chaotic array of irregular to lenticular reddish-weathering troctolite, blotchy-red leucotroctolite (having partial orthopyroxene rims on olivine) and grey to black leuconorite and anorthosite (in which the orthopyroxene is choked with acicular opaque oxide). Red-weathering troctolite, having diffuse lenticules of grey anorthosite, also occurs on the shoreline of Ten Mile Bay, where pegmatitic zones contain olivine in excess of 30 cm. Grey leucotroctolite, olivine-bearing leuconorite and olivine–anorthosite occur on the southern shoreline of Hillsbury Island, and seem to extend inland to the north for about 1 km (*cf.* Emslie *in* Berg *et al.*, 1994, p. 54). The unit is generally devoid of outcrop-scale inclusions, but a tens-of-metres scale (autolithic?) block of leucotroctolite is present at one location on the north shore of Paul Island, and foliated inclusions occur within it on the southern part of Hillsbury Island. Plagioclase megacrysts are locally present, but no preferred orientation is evident. An easterly-striking and shallowly north-dipping compositional layering is apparent at one point on the north shore of Paul Island, and the distribution of the unit on southern Hillsbury Island implies that in this area the troctolitic rocks dip gently northward under the leuconoritic rocks that occupy the higher topographic levels. At several places along the western margin, including the dyke, a layering is parallel to the trend of the contact and dips moderately to the east. Rusty zones, developed over interstitial networks of pyrrhotite, are present on southern Hillsbury Island (*see* NOTES on map sheet). Small zones of massive to semi-massive sulphide occur in the dyke east of Two Mile Bay and were drill-tested by NDT Ventures Ltd., the results showing limited extent to the mineralization (Miller *et al.*, 1996).

Stratigraphic Relationships: This leucotroctolitic intrusion has a western contact that is regionally parallel to the trend of The Bridges intrusion (**P?BI**) in the Two Mile Bay–Ten Mile Bay area, but the map pattern indicates that it truncates the eastern limb of a syncline (synform) of The Bridges rocks and dips eastward off The Bridges layered sequence. It intrudes, and truncates the deformational fabric of, foliated leuconorite assigned to the Quarry intrusion (**P?Qln**) east of Two Mile Bay (although this leuconorite may be part of The Bridges intrusion). The leucotroctolite also intrudes the massive grey leuconorite and anorthosite of The Turnpikes intrusion (**Mtla**) on Paul Island; the contact is somewhat ambiguous, but a dyke most easily explains the map pattern between the troctolitic and other rocks in this area (*see* also Wiebe, 1990; Miller *et al.*, 1996). The map pattern also suggests that the older rock forms a very large roof pendant within the leucotroctolite in the upland area here around Tu' nuliksoa'kh. Unlike The Turnpikes intrusion, the olivine-bearing unit on Paul Island is devoid of inclusions of any proximal rocks.

MTlt
Tessiuyarsuk intrusion: Leucotroctolite, troctolite, and olivine-bearing leuconoritic rocks

Distribution: This intrusion is exposed in the lowland at the entrance to, and east of, Tessiujâtsuk (Saltwater Pond), the geographic feature for which it is named (using the earlier spelling Tessiuyarsuk).

Characteristics: The rocks of this intrusion are friable, medium-grained to pegmatoidal, and mostly dark grey weathering. Orthopyroxene and olivine vary from 1–20 cm in maximum dimension. A fine-grained troctolitic rock having coarse, poikilitic, inverted pigeonite characterizes the actual exposed contact with layered mafic to mesocratic gneissic rocks (**A?mu**) south of Ka' ngilia' luk.

Stratigraphic Relationships: The outcrop distribution of the Tessiuyarsuk intrusion clearly indicates that it is intrusive into both the layered, Archean(?) mafic to mesocratic rocks (**A?mu**) and the Mesoproterozoic Mount Lister intrusion (**MMLa, MMLfm**) to the south of Ka' ngilia' luk. Only the contact with the layered rocks has been directly observed, the relationship to the Mount Lister intrusion being based on the map pattern between the two (*e.g.*, the truncation of layering and deformational fabric of the Mount Lister by the olivine-bearing rock), and on the deformed and recrystallized state of the Mount Lister intrusion in comparison to the undeformed and unrecrystallized state of the troctolitic rock. Extrapolation of the eastern contact beyond the map-area, in combination with unpublished manuscript maps of E.P. Wheeler, indicate that the Tessiuyarsuk intrusion is also younger than the Hosenbein Lake intrusion (**MHln**).

Mclt
Coarse-grained leucotroctolite to olivine leucogabbro

Distribution: This unit denotes a single isolated outcrop, seemingly within the 'upper' ferrodiorite unit of the Barth Island composite intrusion (*see* section on Ferrodioritic Rocks), near the north shore of central Barth Island; further distribution and the precise relation to other rocks in the vicinity have not been determined.

Characteristics: The outcrop comprises a relatively coarse grained rock (1–10 cm grain size), consisting of plagioclase, olivine, lesser clinopyroxene, and abundant opaque oxide. Within it are orthopyroxene(?) megacrysts having olivine cores.

Possible Stratigraphic Setting: The overall character of this rock is unlike the troctolites of the Barth Island composite intrusion itself (*see* above), and it is unlike the ferrodiorite (**MBIfd**) within which it appears to be situated. No direct correlatives for this unit are present within any nearby anorthositic members of the NPS. It could be a large xenolith.

DIORITIC INTRUSIONS

(subdivision includes the Barth Island and Sachem Bay ferrodioritic rocks, as well as several large dykes in the area)

A texturally diverse group of rocks, these are generally opaque-oxide-rich and of gabbronoritic composition (*i.e.*, having both ortho- and clinopyroxene), but to conform with existing nomenclature for the rocks of the Nain area they are collectively referred to as ferrodioritic rocks. These units normally lack the subophitic texture that characterizes the anorthositic intrusions, and generally they are finer grained and more melanocratic than the anorthositic ones, but locally there are coarser variants. The ferrodioritic rocks are enriched in opaque oxide minerals (magnetite and ilmenite); orthopyroxene (inverted pigeonite) oikocrysts are widely distributed and postdate the development of igneous fabrics in these rocks. Mingling with contemporaneous granitic magmas is indicated on outcrop scale by the nature of the contacts between basic and silicic rocks.

MBIfd

Brown-weathering, texturally variable, ferrodiorite and hybrid rocks of the Barth Island composite intrusion

Distribution: This map division includes the rocks extending from the south shore of Nain Bay across Barth Island and north of Nain Bay, both below and above the troctolite unit (‘lower’ ferrodiorite and ‘upper’ ferrodiorite, respectively). The illustrated distribution of these rocks north of Nain Bay is based mainly on a map by Mulhern (1974).

Characteristics: This unit incorporates a texturally and compositionally diverse group of rocks, varying from homogeneous granular types to ‘porphyritic’ (megacrystic) types in which phenocrysts and/or xenocrysts of feldspar may be present either as single and/or multigrain components having oval or lenticular form. Olivine is present in some of these rocks, and inverted pigeonite is widespread. Apatite and zircon are generally present, but their morphology and abundance vary considerably, even between proximal rocks. Modal mineral volumes indicate rock compositions include gabbro, gabbronorite, and jotunite (hypersthene monzodiorite).

On the west shore of Barth Island the ‘lower’ unit is compositionally layered, east-dipping and clearly derived from a composite and mingled group of magmas. Layering here indicates pulses of single-component and hybrid magmas, and trough structures imply that magma currents and erosional activity contributed to the attributes of the sequence. Present are orthopyroxene–poikilitic (inverted pigeonite), fine-grained, ferrodiorite having load-casts into monzonitic rocks

underlying it, and streaky-textured 'porphyritic' (megacrystic) rocks comprising variable concentrations of perthite and/or quartz-cemented boxy plagioclase in a ferrodioritic matrix. The ferrodioritic rocks here also have irregular pegmatoidal quartz-feldspar-hornblende-biotite patches (trapped silicic magma??) adjacent to which poikilitic black hornblende is developed within the finer grained rock (a feature also present on Pikalujak Islet). Olivine is apparently absent from the rocks on this part of the island. The relation of the western Barth Island layered sequence to the overlying charnockitic granitic rock (**MBIfmz**) suggests that the latter has a fayalite-bearing cumulate base atop the ferrodiorite.

The 'lower' ferrodioritic unit at the eastern side of Barth Island is a granular rock that exhibits abrupt grain-size and compositional changes, is locally enriched in streaks of feldspar xenocrysts and has a weak compositional layering. Poikilitic orthopyroxene (inverted pigeonite) is locally present, and olivine, or its alteration product iddingsite, occurs in some of the easternmost rocks. The 'lower' belt of granular gabbronoritic rocks below monzonite (**MBIfmz**) on the south shore of Nain Bay is texturally different from most of the ferrodioritic rocks at the same stratigraphic level on western Barth Island. The southern rocks are

i) uniform granular,
ii) lack the sharply defined and composite layering,
iii) locally have isolated and discontinuous trains of dark grey plagioclase crystals and associated leucogabbronorite (possibly representing a disaggregated earlier cumulate),
iv) are diffusely foliated/banded, and
v) have elongate seams or schlieren of pyroxene.

These southern rocks also have abundant disseminated opaque oxide. In common with the 'lower' unit on Barth Island, the ferrodiorite south of Nain Bay has poikilitic orthopyroxene (inverted pigeonite), and appears to be devoid of olivine.

The 'lower' ferrodiorite along the northwest margin of the Barth Island body comprises fine grained homogeneous and hybrid rocks locally having abundant streaky trains of cream-coloured feldspar crystals. Along the northern and eastern margins of the Barth body to the north of Nain Bay, as shown on the map of Mulhern referred to above, the 'lower' unit contains coarser grained gabbroic textured rocks than elsewhere; complexly exsolved pyroxenes are present in some of these rocks. Hybrid rocks at Webb's Neck have megacrysts (phenocrysts or xenocrysts) that are composed of skeletal intergrowths of plagioclase and potassium feldspar, and have numerous variably corroded zircons. Olivine is present in some of the rocks at Webb's Neck and along the eastern margin on Barth Island; hornblende and biotite locally enclose the pyroxene and olivine in these rocks.

The 'upper' ferrodiorite on the northern shoreline of Barth Island is an olivine-rich gabbroic rock that is texturally diverse from a grain size perspective: coarser (pyroxene and olivine up to 7 cm) and finer phases (equigranular rock having grains <0.5 cm) are interspersed in abrupt to apparent gradational contact (may indicate differing nucleation rates or the plutonic juxtaposition of two partially crystalline magma bodies having differing crystal development). Poikilitic orthopyroxene (inverted pigeonite?) occurs in the finer grained rocks in places, and pegmatoidal granitic patches having poikilitic hornblende are locally present. Through central Barth Island the 'upper' unit rock is granular and the grain size is generally 0.5–1 cm. Like on the coast, poikilitic

orthopyroxene and poikilitic black hornblende are both present locally, and there are scattered crystals of intergrown potassium feldspar and plagioclase. In some rocks the plagioclase has a potassium feldspar rim, and in others there are multigrain plagioclase+pyroxene aggregates that are cemented by quartz. Some rocks included in the 'upper' unit on Barth Island are monzodioritic and monzonitic in composition, and some contain quartz. The unit in the central part of the island is also characterized in places by an abundance of irregular to globular enclaves of fine-grained basaltic composition, some of which are elongate and steeply plunging when viewed on vertical surfaces (subvertically stretched while still soft?), and some of which contain xenocrysts of Carlsbad-twinned potassium feldspar.

Regional Structure: The ferrodioritic rocks appear disposed as variably-dipping bodies above and below the troctolite within the Barth Island composite intrusion. The layering and foliation of the outermost ('lower') unit are inward-dipping around the intrusion, indicating a funnel or cone form.

Stratigraphic Relationships: This outer unit is clearly in intrusive contact with the rocks to the west and to the east. The contact with the Archean gneisses (**Aggl**) is exposed on the small island west of Barth Island, where the ferrodiorite has yielded a zircon crystallization age of 1321±1 Ma, and the contact with leuconorite (**Mla2**) is exposed at the east end of Barth Island. The nature of the contact between the external ferrodiorite halo and the leuconoritic rocks (**MUfz, MAln**) west of Akpiksai Bay is not fully documented apart from the 500-foot hill directly east of Pikalujak kangidlua where ferrodiorite abuts leuconorite and includes rafts of massive to foliated leuconorite and anorthosite presumably derived from proximal country-rock, as well as coarser grained (older?) ferrodiorite like that on the hillside to the south (**Mlfd**). Contacts between the generally coarse-grained gabbroic rocks and the adjacent leuconorite and anorthosite intrusions on the north side of Nain Bay are less well defined, the junction being drawn largely on the change in texture and the dominant mafic mineral in the rock. No contacts between the 'upper' ferrodiorite and the abutting troctolite (**MBIt**) have been observed, but a ferrodiorite dyke has intruded leucotroctolite on the small island north of Barth Island.

The Barth Island ferrodioritic rocks are apparently intruded only by biotite-bearing granitic pegmatite dykes (adjacent to which the older rock has an amphibolitization rind) and by diabase dykes, thus making the Barth Island composite intrusion quite probably the youngest pluton in the immediate area of Nain (but not the youngest in the map area).

MSfd

Sachem Bay intrusion: brown-weathering, texturally variable, ferrodiorite and hybrid rocks

Distribution: This unit underlies a large area north of Sachem Bay and a smaller triangular area south of the Bay.

Characteristics: The Sachem Bay ferrodioritic rocks are similar to those of the Barth Island composite intrusion, in being brown-weathering, granular to somewhat gabbroic-textured, friable, gabbronoritic rocks having local abrupt grain-size variations. There is weak layering evident locally on the north and south sides of Sachem Bay. Irregular greenish-brown oikocrystic

orthopyroxene (inverted pigeonite) is locally obvious, and the white to grey indigenous plagioclase is generally anhedral. The unit locally has tabular to equant, dark-grey, plagioclase and buff perthitic potassium feldspar crystals of assumed xenocrystic origin. Olivine is present in some rocks, and poikilitic hornblende and/or biotite may be present. Interstitial quartz is widespread in this unit, and there are lesser examples of oval ('drop') quartz. Ilmenite is abundant, and generally lacks the clear intercumulus habit of oxide in the anorthositic rocks; apatite and zircon are abundant. Within this unit are lenticular, diffuse-bordered centimetre- to metre-scale zones of granitic rock, and rocks of assumed hybrid origin which have widespread distribution of potassium (?) feldspar crystals.

Stratigraphic Relationships: The Sachem Bay intrusion has been emplaced into the Archean quartzofeldspathic gneisses (**Aggl**) and the layered mafic rocks (**A?mu**) north of Sachem Bay, and contains rafts of layered mafic rocks on the north shoreline of the Bay. It is in mingled contact with some of the adjacent rapakivi-type quartz monzonite (**MSgr**), which locally forms diffuse-bordered lenses within it (*e.g.*, coastal area north of Webb's Point). It is assumed to intrude seriate leuconorite (**Msln**) south of Sachem Bay; the actual contact has not been observed, but this relative relationship is implied by the map pattern and from one raft of seriate-type leuconorite within the ferrodiorite along the western border of the unit southwest of Sachem Bay. It may be older than the mottled Halfway Point leuconorite (**MHPln**) on the west side of Sachem Bay, the Tikkiraluk Hill troctolite (**MTtr**) north of the Bay, and the First Rattle leuconorite (**MFRa**) near Webb's Point; no direct contact between the ferrodiorite and these units has been observed, but the map pattern implies a crosscutting relationship.

Mxfd
Granular brownish ferrodiorite

Distribution: This is a narrow, apparently bifurcating, dyke that stretches north–south on the eastern side of the valley east of Conch Bay.

Characteristics: The rock assigned to this map unit is a brown-weathering, granular, gabbronoritic one. It varies from massive to streaky-layered, and at its southern end contains dark grey plagioclase crystals like those in the adjacent leuconorite. It locally exhibits a hybrid character, in as much as it has schlieren of coarse-grained monzonite.

Stratigraphic Relationships: This ferrodiorite unit forms a sheath separating the western border of the seriate leuconorite (**Msln**) from Archean(?) layered ultramafic to anorthositic rocks (**A?mu**) and associated quartzofeldspathic gneisses, and locally it forms narrow dykes within these layered rocks. At its southern end it dips gently eastward underneath the leuconorite (**Msln**), but the contact between the two is diffuse. The unit may not be as continuous as portrayed on the map, and in places seems to be just a sheet a metre or so thick. This ferrodiorite is very similar to the Barth Island ferrodiorite (**MBIfd**), and could merge into the larger intrusion in the sandy valley to the south; it is considered to be a separate (older?) unrelated unit, however, because of its setting.

MAfd
Akpaume? ferrodiorite: granular brownish ferrodiorite

Distribution: This unit is an east–west dyke west of Akkuliakha' ttakh (at the western end of the Cape Williams peninsula). The dyke has not been investigated on the ground, its extent having been sketched from reconnaissance aerial observation.

Stratigraphic Setting: This dyke is emplaced into the Mount Lister intrusion (**MMLa**), and is probably an extension of one of the dykes mapped by Deuring (1976) to the west of this map-sheet, where they are described as ferromonzonite related to the *ca.* 1333 Ma Akpaume (Ukpaume) intrusion (a ferrodiorite to ferromonzonite body emplaced into the Mount Lister intrusion just west of map-sheet).

MSKfd
Satorsoakulluk dykes: Granular brownish ferrodiorite

Distribution: This unit includes a curving dyke that can be traced from Barth Island to Base Island, and a parallel bifurcating smaller dyke to the south on Base Island and an adjacent island. The stratigraphic name is derived from the local name (using an earlier version of the current Inuktitut spelling shown on the map) for Base Island.

Characteristics: Each of the dykes is generally a single intrusion, but on parts of the shoreline of Base Island the bigger dyke seems to comprise several narrower parallel intrusions, and the secondary dyke to the south appears to branch into east- and southeast-striking segments before disappearing inland under gravel. The dykes are composed of fine- to medium-grained, brown-weathering, massive rock, but a weak strike-parallel layering is locally visible; narrow segments have chilled margins. At its westernmost exposure on the south shore of Barth Island the larger dyke is a composite intrusion, having numerous angular fragments. Here it comprises a slightly feldsparcrystic (ovoidal potassium feldspar), medium-grained, ferrodiorite and a pillowed, fine-grained phase, the latter exhibiting dumb-bell and diapiric structures consistent with viscosity (flow) contrasts between the differing phases of the composite magma as it encountered the fragments or was depressed by them. A similar two-component rock is present at the northern part of the dyke on the island, where the coarser phase is porphyritic and the finer phase is less enriched in pheno(xeno)crysts. The overall composition of this unit is gabbronoritic, with the modal minerals being dominated by varying volumes of plagioclase, clinopyroxene, poikilitic orthopyroxene (including inverted pigeonite), biotite, hornblende, lesser potassium feldspar, and rare quartz; opaque oxide, zircon and apatite are nearly universal accessories.

Stratigraphic Relationships: These dykes crosscut several major units of the map-area. Zircons in the dyke south of Sakkutalik give U–Pb crystallization ages of 1315±3 Ma, whereas the baddeleyite from the same rock yields a crystallization age of 1301±1 Ma (Hamilton, 1997). The zircons are considered to be inherited, whereas the baddeleyite age reflects the time of crystallization of the dyke magma. The xenolithic fragments in the dyke on southern Barth Island represent both proximal and exotic material: anorthosite, gneisses, ultramafic rocks, layered oxide-bearing ferrodiorite (unlike any seen in the area), hybrid diorite having granitic pegmatite veins as at the

west end of Barth Island, and a diatremic breccia having a diversity of rounded clasts including granitic, ultramafic and calc-silicate rocks and milky quartz. Xenolithic fragments on the north shore of Base Island, where the dyke crosscuts foliated olivine bearing rocks (**M?mflta**), are nearly all seriate-textured leuconorite and clearly exotic with respect to the walls. The dyke on Base Island is crosscut by several types of younger subordinate dykes: a network of granitic veins that seem to be spatially associated with the dyke, a network of pale-weathering, prismatic-pyroxene-bearing granodioritic(?) dykes, and a grey tonalitic dyke adjacent to which the ferrodiorite is amphibolitized. On the north shoreline of Barth Island the Satorsoakulluk dyke is intruded by a gently south-dipping composite sheet of granitic composition, comprising alternating layers of aplitic and pegmatitic character in which the finer and more melanocratic phases have undulate bases ('load casts') and sharp tops against the pegmatitic member. The Satorsoakulluk ferrodiorite dykes are also intruded by olivine diabase dykes.

Moxf
Rusty, locally oxide(magnetite)-rich ferrodiorite

Distribution: This unit includes those rocks that comprise the series of interconnecting sheets and dykes – a stockwork – west of Akpiksai Bay; smaller dykes of similar character on the ridge west of Nain may be temporally equivalent (*see* "Minor Intrusions"). The portrayal of this unit west of Akpiksai Bay is schematic, encompassing the area over which the intrusions are most abundant.

Characteristics: These are fine- to medium-grained, dark brown to rusty, granular, massive to diffusely layered, gabbronoritic rocks having an abundance of magnetite and a variable content of sulphide minerals. The attitude of the contact between this unit and older rocks varies from subhorizontal to subvertical. These rocks are locally porphyritic, but also contain dark grey plagioclase crystals that may be xenocrysts. The main minerals are plagioclase, clinopyroxene, and orthopyroxene, with lesser poikilitic brown hornblende and biotite, and a variable volume of opaque oxide. In some cases the silicate crystals are supported by an oxide matrix, indicating the latter was probably a substantial liquid component in the intrusions at time of emplacement. These rocks differ from most other ferrodioritic rocks in the area by the paucity of apatite and apparent absence of zircon.

Stratigraphic Relationships: The main mass west of Akpiksai Bay appears to have exploited the contact between strongly foliated leuconoritic rocks of the Unity Bay intrusion (**MUfz**) and the massive to weakly foliated leuconoritic to anorthositic rocks of the Akpiksai Bay intrusion (**MAln**). It contains inclusions of both foliated and massive leuconorite. It is possible that these oxide-rich rocks predate the Hosenbein Lake intrusion (**MHln**), although this cannot be determined because the two are not in direct contact. The proposition of relative age is predicated on the presence of such oxide-rich dykes within inclusions of Unity Bay intrusion hosted by the Hosenbein Lake intrusion but their absence from the enclosing leuconorite itself. The unit may be intruded by the fine-grained ferrodiorite of the outer Barth Island intrusion (**MBIfd**) west of Akpiksai Bay; the contact was not observed, but these sheets differ from the proximal Barth Island ferrodiorite in containing hornblende and lacking apatite and zircon. The unit is intruded by aplitic granitic dykes, and by a densely porphyritic diabase dyke (the 'Nain Hill dyke', **dp**) west of Akpiksai Bay.

Mlfd
Layered to massive buff- to brown-weathering, oxide-rich olivine-bearing gabbronoritic rock

Distribution: This is a unit of questionable lateral continuity along the shoreline and east of Pikalujak kangidlua.

Characteristics: This unit includes several morphologically different exposures: a layered, steeply-dipping, olivine- and oxide-rich rock abutting gneisses on the south shore of Pikalujak kangidlua, as well as massive, fine-grained to coarse-grained rocks east of the cove. The temporal and lithological correlation of these texturally different rocks is tenuous. The layered part of the unit along the coast consists of well-defined compositional variations, on a centimetre to metre scale, of granular rocks ranging from olivine gabbro to peridotite, within which are ilmenite-rich and sulphide-bearing layers. The oxide-rich parts of this intrusion differ from superficially similar rocks proximal to Nain in having ilmenite instead of magnetite as the metallic oxide. The fine- to coarse-grained massive rocks east of the cove lack olivine; these locally contain dark bluish-grey plagioclase megacrysts up to 8 cm in cross-section. The easternmost coarse rocks differ texturally from the nearby finer grained granular rocks of the Barth Island intrusion (**MBIfd**) in having a subophitic relationship between the feldspar and pyroxene (the mineral domains now composed of statically recrystallized anhedral grain aggregates).

Stratigraphic Relationships: The layered sequence on the coast abuts and intrudes Archean quartzofeldspathic gneisses (**Aggl**), and contains inclusions of both mafic and quartzofeldspathic gneiss. The massive fine-grained rocks east of the cove intrude layered mafic to mesocratic rocks (**A?mu**). Dykes of coarse-grained rock pervade leuconorite assigned to the Akpiksai Bay intrusion (**MAln**) on the eastern side of the cove.

This unit could be an off-shoot from the Barth Island ferrodioritic group (**MBIfd**), but its map pattern suggests that it is a separate intrusion into gneisses and the Akpiksai Bay leuconorite which has been later intruded by the southern ferrodiorite of the Barth Island composite intrusion. The latter interpretation is based on the map pattern and the presence, on the 500-foot hill east of Pikalujak kangidlua, of one inclusion within fine-grained Barth Island ferrodiorite of coarse-grained rock similar to a nearby outcrop assigned to this unit.

Mfd
Coarse, buff- to brown-weathering, oxide-rich gabbronoritic rock

Distribution: This is a single lenticular unit west of the crest of the ridge west of Nain.

Characteristics and Stratigraphic Setting: It comprises medium- to coarse-grained and magnetite-rich gabbronorite of uncertain affinity occurring as an inclusion within the Unity Bay intrusion.

GRANITIC INTRUSIONS

(includes rocks of more than one age, type and origin)

The rocks included in this subdivision are mostly coarse grained, encompassing those interpreted to be of cumulus and intrusive origin with respect to some of the rocks they abut. They run

the gamut from massive to strongly foliated, the latter having fabrics attributable to igneous as well as post-crystallization processes. Many of the granitic rocks contain olivine.

MLfmz
Massive to strongly foliated, fayalite-bearing, porphyritic monzonite and syenite

Distribution: This is a semi-continuous unit of varying width that is traceable from east of Ugjutoarsuk (Webb's) Bay across Nain Bay as far south as Ka' ngilia' luk. It seems to be widest east of Ugjutoarsuk (Webb's) Bay, where it is less deformed than in most other settings where it has been seen.

Characteristics: The rocks of this unit are generally pale pink to white on weathered surface, but generally bluish-green on fresh surface where olivine is unaltered. The regionally consistent mineral assemblage comprises microperthitic/mesoperthitic feldspar, clinopyroxene, and olivine, along with subordinate volumes of plagioclase, quartz, hornblende and biotite; zircon is an abundant mineral in these rocks. South of Nain Bay this unit is strongly foliated, locally preserving indications of an original coarse-grained nature in the form of potassium feldspar lozenges and quartz lenticles. East of Ugjutoarsuk (Webb's) Bay the rock is diffusely layered, fine-grained, brown to pink, and having a few scattered potassium feldspar phenocrysts; foliation here is less intense than to the north and south.

Stratigraphic Relationships: This foliated syenitic to monzonitic rock forms a discontinuous unit between the foliated leuconoritic to anorthositic margin of the Mount Lister intrusion (**MMLfm**) and the bounding Archean gneisses and layered rocks (**Aggl, A?mu**). Its setting indicates that it is a sheath around the Mount Lister intrusion. U–Pb isotopic data from zircons extracted from this unit at Webb's Bay to the north of the map-sheet indicate an igneous crystallization age of 1343±3 Ma (Connelly and Ryan, 1994). The close association and the continuity of deformational fabrics across the boundary between this unit and the Mount Lister intrusion imply that both were (emplaced and?) deformed synchronously. The external contacts with bounding gneisses south of Nain Bay and east of Ugjutoarsuk (Webb's) Bay are 'tectonic'. The largest unit east of Ugjutoarsuk has a screen of laminar-banded quartzofeldspathic gneiss and quartzite within it. The unit is intruded by the seriate leuconorite (**Msln**) west of Sachem Bay; the nature of the contact is based on map pattern between the two units because no direct contact has been observed. The roof of the seriate leuconorite intrusion is interpreted to dip gently westward beneath the monzonite along the contact. The sheath is also intruded by composite basic-felsic dykes, postdating the foliation of the host but being foliated themselves.

MBIfmz
Massive to foliated, fayalite-bearing granitic rocks (monzonite and quartz monzonite) of the Barth Island composite intrusion

Distribution: This unit encompasses all the granitic rocks associated with the Barth Island ferrodiorite and troctolite on the south side of Nain Bay, at the west end of Barth Island, and north of Nain Bay.

Characteristics: These are mostly brownish to pale grey to slightly rusty to pale buff coloured rocks. There is a bluish-green cast on fresh surfaces where olivine is present. They range from even grained to porphyritic, locally having 2.5 cm feldspar phenocrysts. Distinct 'eyes' of grey quartz are conspicuous in some rocks, and plagioclase crystals having potassium feldspar rims are locally present. A foliation, formed prior to full consolidation, is present in parts of this unit, and is best defined by trains of olivine, pyroxene and opaque oxide separating quartz-feldspar domains. On the south side of Nain Bay the unit has enclaves of 'porphyritic' mafic rock, derived either from fragmentation of mafic dykes or from incorporated contemporaneous mafic magma. One or more of the following mafic minerals is present in varying volumes in the granitic rocks of this unit: olivine, orthopyroxene, clinopyroxene, hornblende, and biotite.

Stratigraphic Relationships: This unit is disposed as lenticular zones at differing stratigraphic levels within the Barth Island composite intrusion, and likely includes products of more than one pulse of silicic magmatism. Contact relations with abutting rocks are inconsistent and variable, and indicate more than one style of emplacement. The following examples illustrate some of the variations:

The contact with the overlying troctolite (**MBIt**) on Pikaluyak Islet and at the easternmost coastal exposures near Khikkertau' kät is sharp. There is a very thin veneer of fine-grained oxide-rich gabbronoritic rock, locally having remnants of olivine, separating coarse-grained, diffusely layered, foliated, mafic-enclave-bearing quartz monzonite from troctolite, and along this contact the finer-grained rock and the monzonite are mingled. The interface here is locally lobate in form, and irregular streamers of monzonite interfinger with the finer rock. Irregular buff-weathering, alkali feldspar-rich, charnockitic, aplitic dykes penetrate the troctolite above the contact at several points between Pikalujak and Khikkertau' kät. It is possible that the troctolite was emplaced across an unconsolidated cumulus monzonitic substrate, and that the weight of the overlying troctolite filter-pressed residual magma upward to produce the aplitic dykes as well as contributing to the formation of the foliation and the flattening/elongation of still-soft mafic globules in the silicic rock. Zircons extracted from the monzonite south Khikkertau' kät were analyzed by M.A. Hamilton, yielding a U–Pb crystallization age of 1320±1 Ma (*see* Hamilton, 1997).

The contact with the underlying fine-grained rock (ferrodiorite, **MBIfd**) inland south of Nain Bay is abrupt, but seems to mark a mingled interface; monzonite is white-weathering and apparently olivine-free within 10 m or so of the contact with the finer mafic rock, and it is locally foliated along this junction. The interpretation of this contact is equivocal, but may represent one where the dense ferrodiorite magma was emplaced into a chamber along an original contact between solid leuconorite and a slushy monzonite cumulate, lifting the latter from its floor, or one where the diorite formed the floor to a silicic influx.

At the west end of Barth Island, the monzonitic rocks appear to grade from a coarse-grained feldspar-enriched base of cumulate character (sitting against fine-grained ferrodiorite) to higher levels of finer grained (<1 cm) monzonitic to quartz-monzonitic rock in which quartz is oval and some potassium feldspar crystals have plagioclase mantles (rapakivi texture). The latter rock type contains angular, biotite-porphyroblastic, troctolite inclusions near the junction with the troctolite, a contact relationship that is radically different from that south of Nain Bay.

The stratigraphic position of the granitic rocks north of Nain Bay is different from that to the south, namely totally encased by massive ferrodiorite, hybrid rocks, and coarser gabbroic rocks. Insufficient observation of contacts negates firm statements regarding the relationships between the different units.

MSgr
Coarse-grained, pyroxene- and olivine-bearing granitic rocks north of Sachem Bay

Distribution: This unit includes all the granitic rocks forming the arcuate body and irregular masses associated with the ferrodiorite in the highland region north of Sachem Bay.

Characteristics: These are coarse-grained, slightly brown to white-weathering, pyroxene- and olivine-bearing rocks, within which some variants are particularly quartz-rich. Some rocks, for example the dykes west of Webb's Point, lack olivine and have two pyroxenes (including inverted pigeonite). Mafic enclaves are widely distributed, and a pre-full-consolidation foliation is locally developed. Poikilitic black hornblende is locally prominent in the white-weathering variants. These rocks locally display characteristics of rapakivi granites, namely oval feldspars and aggregates of 'drop' quartz.

Stratigraphic Relationships: These rocks, like the ones within the Barth Island composite intrusion, appear to be derived both from silicic cumulates and from distinct intrusive bodies. The small units forming the hill-tops west of Tikkiraluk Hill, which are interlayered with ferrodiorite and hybrid rocks (**MSfd**), certainly seem to be of cumulus origin, and lenses of olivine-bearing monzonitic rock are present as diffuse-bordered bodies in ferrodiorite north of Webb's Point. These intimate associations of granitic and ferrodiorite rocks can be interpreted to denote a temporal correlation between the two. The granitic rocks are in intrusive contact with the Archean gneisses (**Aggl**) near Tikkiraluk Hill; blocks of gneiss occur in the granitic rock, and granitic dykes cut the gneiss. The granitic rocks are intruded by the Tikkiraluk Hill troctolite (**MTtr**), as indicated by the transgressive contact between the two units north of Sachem Bay. One exposed interface between the two rocks is sharp, but features imply that the granitic rocks may not have been totally solid at the time of contact: the troctolite is fine grained (could be a ferrodiorite) at the contact and contains sparse feldspar and pyroxene-rimmed quartz xenocrysts from the underlying granitic rock; the fine-grained massive rock passes stratigraphically upward into coarser olivine gabbro and troctolite within 5 m of the contact. This contact is similar to those between troctolite and granitic rocks in the Barth Island composite intrusion, implying a similar contemporaneity to the granitic, ferrodioritic, and troctolitic rocks of the Sachem Bay region.

MINOR INTRUSIONS

These rocks are generally subordinate in comparison to the other igneous rocks of the area, and may embrace a wide absolute age range. They include, particularly, the regionally widespread basic and silicic dykes, as well as other more continuous dykes; not all such intrusions in the area are portrayed on the map. Chlorite and epidote alteration have affected all these rocks to varying degrees.

dlm
Meta-lamprophyre (?)

Distribution, Character, and Stratigraphic Setting: This is a single, north-striking, 10- to 30-cm-wide, deformed, ultramafic (spessartite?) dyke containing olivine, brown hornblende, clinopyroxene, and minor plagioclase; intruded into foliated and layered meta-anorthosite and associated mesocratic rocks (**A?mu**) south of Ka' ngilia' luk. This dyke has no compositional counterparts among ones ascribed to the NPS magmatism or ones crosscutting NPS plutons. This anomalous composition, in concert with its geological setting, offer grounds to conclude that it likely predates the NPS and is Paleoproterozoic (or older).

Mgbn
Leucogabbronoritic sheet

Distribution: This is a single subhorizontal dyke (sheet) south of Nain.

Characteristics: The rock displays seriate texture, and comprises grey, pearly lustered, plagioclase crystals having labradorite schiller, set in matrix of granular clino- and orthopyroxene and equant, anhedral, cream plagioclase.

Stratigraphic Setting: This dyke occurs within recrystallized leuconorite of the Unity Bay intrusion (**MUlna**), its emplacement postdating the high-T recrystallization of the host. It may be related to the Hosenbein Lake intrusion to the west (**MHln**).

Mkm
Kaiktusuak dykes: Massive, slightly porphyritic, fayalite-augite monzonite

Distribution: These dykes are found almost exclusively within the Mount Lister intrusion (**MMLa, MMLfm**). The lone exception is a texturally different and coarser grained granitic rock located in the gneisses (**Aggl**) south of Ka' ngilia' luk which appears to be a strike continuation of a dyke located northwest of the lake.

Characteristics: These intrusions occur as single dykes, up to 25 m wide, or as a series of narrower parallel dykes. They are mostly fine-grained, yellowish-brown to white-weathering rocks, being distinctly bluish-green on fresh surface signifying the presence of olivine. They have rare feldspar phenocrysts. They exhibit sharp, straight-walled contacts with older rocks, but chilled margins are not pronounced. In addition to mesoperthitic feldspar, plagioclase, and olivine, these rocks also contain clinopyroxene and an abundance of apatite and zircon. The coarser grained dyke that has intruded the gneisses lacks olivine, and contains green hornblende. The differences in texture and mineral content between the dykes in the Mount Lister intrusion and that in its envelope may be a function of host-rock influence on crystallization.

Stratigraphic Setting: The Kaiktusuak dykes postdate the deformation and recrystallization of the Mount Lister intrusion (**MMLa, MMLfm**). They are considered to be also younger than all other dykes within that intrusion with the exception of perhaps some pink granitic ones and the olivine

gabbro/diabase dykes. Binocular observations of a cliff at Cape Williams suggest that a Kaiktusuak dyke there is offset along subhorizontal gabbronoritic dykes, but this has not been verified by outcrop examination.

dgl
Black and dark-grey gabbronoritic (ferrodioritic?) dykes, many of which are hornblende- and biotite-rich

Distribution, Character, and Stratigraphic Setting: This subdivision of the mafic dykes is not present throughout the whole area, but is localized to specific areas. These dykes, generally less than 2 m wide, are a diverse and undivided group of fine- to medium-grained rocks of several generations. Most dykes contain two pyroxenes (including inverted pigeonite), the relative abundance of each being variable. Hornblende and/or biotite may be present, and in some rocks the former is the dominant mineral; these enhance the foliation. Grey, oxide-dusted, plagioclase megacrysts in some dykes appear to be xenocrystic. Some dykes contain quartz, and many are oxide-rich and contain apatite and zircon. Secondary alteration – chlorite, epidote, actinolite – has locally overprinted the primary minerals. The dykes exhibit combinations of any of the following features: granular, massive, foliated, straight-walled, lobate-walled, sinuous, steeply inclined, subhorizontal. The foliated ones seem to have been locally deformed by movement of opposite walls of their host prior to complete crystallization, and the foliation is defined by features such as preferentially oriented biotite, elongate plagioclase, and aggregates of pyroxene or opaque oxide. Several dykes assigned to this group are present within the gneisses (**Aggl**) south of Nain Bay, but such dykes are most abundant in the Unity Bay (**MUlna, MUfz**) and the Mount Lister (**MMLa, MMLfm**) intrusions, where they postdate the deformational fabrics of their hosts. Those within the eastern part of the Mount Lister intrusion may be contemporaneous with the composite dykes (*see* below) that occur within this intrusion. Rare, centimetre-scale dykes of this type are also present in the foliated anorthositic rocks (**M?mflta**) on Base Island and on Rhodes Island, within the Halfway Point intrusion (**MHPln**), and within the First Rattle intrusion (**MFRa**).

dc
Composite basic-silicic dykes

Distribution, Character, and Stratigraphic Setting: Dykes of this type have restricted distribution, and are considered to include several generations. They are characterized by basic and silicic compositions within the same tabular body, and vary from less than 1 m to over 10 m in width.

One subvertical dyke, having the silicic component mostly confined to its margins, has intruded deformed Paleoproterozoic(?) metagabbro (**P?gbn**) on George's Island.

Numerous, brown to dark grey, composite dykes are found within the Mount Lister intrusion (**MMLa, MMLfm**) and its sheath of monzonite (**MLfmz**). These dykes are a few tens of centimetres to tens of metres in thickness. They are subhorizontal in the anorthositic rocks in the vicinity of Mount Lister peak and Nain Bay, but subvertical in the monzonite east of Ugjutoarsuk (Webb's) Bay. They generally comprise a network of pyroxene-bearing granitic rock separating a more abundant component of fine-grained, hornblende- and/or biotite-bearing, two-pyroxene mafic

rock (gabbronorite) having a pillowed form. These dykes postdate the deformation and recrystallization of their hosts, but are themselves internally foliated and deformed (including having small-folds of the two components).

One undeformed dyke, unrelated to the above dykes, occurs within the eastern ferrodiorite (**MBIfd**) of the Barth Island composite intrusion near Webb's Neck along the north shore of Nain Bay. Here the dyke comprises a biotite+hornblende diorite in a pillowed relationship with aplitic biotite leucogranite.

dfd
Dioritic dykes, including oxide- and pyroxene-rich dykes

Distribution, Character, and Stratigraphic Setting: This subdivision includes east-striking dykes on the ridge west of Nain, a southeast-striking dyke southwest of Pikalujak kangidlua, and a one separating the foliated margin of the Mount Lister intrusion (**MMLfm**) from the layered rocks (**A?mu**) east of Conch Bay.

The dykes near Nain are generally brown-weathering, and vary from gabbronoritic to pyroxenitic. They are also locally layered (including magnetite-rich layers) parallel to their trend, contain numerous plagioclase xenocrysts, and most contain brown hornblende. They are subparallel to the regional structural grain, are particularly magnetite-rich and locally contain small sulphide concentrations; the magnetite-rich ones may have been emplaced as a mixture of oxide liquid and a silicate slush. Such dykes seem to be confined to the Unity Bay intrusion (**MUlna, MUfz**), and are absent from the abutting and younger Hosenbein Lake intrusion (**MHln**).

The dioritic dyke near Pikalujak kangidlua differs from, and is not considered to be related to, those near Nain. This fine-grained gabbronoritic dyke contains abundant inverted pigeonite, apatite and corroded zircon, and crosscuts the northern part of the Hosenbein Lake intrusion (**MHlno**).

The dyke, or sill, separating the Mount Lister intrusion from its bounding layered rocks is an oxide-rich olivine-bearing gabbro, the presence of olivine setting it apart from similar oxide-rich dykes near Nain.

dgp
Olivine-bearing, pegmatitic, gabbroic or ferodioritic dykes

Distribution, Character, and Stratigraphic Setting: These dykes, up to 2.5 m wide, have been observed only in the Mount Lister intrusion (**MMLa**) west of Kaiktusuak Point. The easterly, most spectacular, ones occupy an array of brittle fractures in white saccharoidal anorthosite. They exhibit brownish- to off-white- weathering, and are oxide- and olivine-rich rocks, which in places have acicular clinopyroxene up to 1.5 m x 2 cm. Some dykes are zoned (multiple injections) and some have comb-textured plagioclase and pyroxene. These dykes locally contain an abundance of subhedral to euhedral, maple-sugar-brown to pink-brown zircons (up to 2 cm in maximum size), concentrated along the dykes' margins. Zircons extracted from one of these dykes yielded a U–Pb

crystallization age of 1326±1 Ma. These unique dykes may be offshoots from the Akpaume (Ukpaume) intrusion, a 1333±2 Ma ferrodioritic stock just off the map sheet to the west between Nain Bay and Tikkoatokak Bay.

dg
Granitic dykes (many not shown on map; those shown are exaggerated in size for illustrative purposes)

Distribution: Granitic dykes are regionally distributed.

Characteristics and Stratigraphic Relationships: There is great diversity among the rocks assigned to this map unit. They include pink, grey and white aplitic and pegmatitic granitic dykes of several ages, having subhorizontal to subvertical attitudes; hydration of host-rock is evident adjacent to the margins of granitic dykes in some cases. Some dykes exhibit pronounced graphic texture between quartz and orthoclase or microcline. Most of these dykes have biotite as the mafic constituent, and many contain allanite and titanite; some dykes have 'drop' quartz. Chlorite and epidote alteration of the primary minerals is variable. Dykes having the aforementioned general features can be found as outcrop-scale bodies cutting most of the other rock types in the area. Particularly noteworthy among these dykes is a subhorizontal, layered dyke, approximately 8 m thick, intruded across the Satorsoakulluk dyke (**MSKfd**) on northern Barth Island. This particular dyke comprises pink, pegmatitic, magnetite-bearing granite and grey, aplitic, biotite-leucogranite; the boundary between the two variants is characterized by a 'load-cast' base and a sharp top to the aplitic layers.

Also included in this map unit are grey- to white-weathering clinopyroxene- and hornblende-bearing quartz-monzodioritic dykes cutting the Satorsoakulluk dyke (**MSKfd**) on northern Base Island, and a hornblende+biotite granodiorite intruded into The Turnpikes intrusion (**MTla**) on the northwest shore of Hillsbury Island below Seal Hill. An additional dyke included with this unit is a grey, two-pyroxene, granitic/granodioritic dyke on a small island near Base Island.

In some outcrops it can be demonstrated that grey granitic dykes predate a pink granitic type, but this may not be a universal relationship. It is possible that the granitic dykes could be used as a criterion to distinguish between intrusions: the Unity Bay and South Channel Cairn intrusions have dykes showing several orientations but the Hosenbein Lake intrusion appears to have only a northeast-striking group.

dgb; dp
Olivine gabbro and diabase; feldspar porphyritic dykes

Distribution, Character, and Stratigraphic Setting: This group of 'late' dykes is regionally distributed. At least two generations of such dykes are present. They are tabular intrusions, from less than a metre to more than 10 m wide; several of the largest dykes have been traced intermittently (and extrapolated) several kilometres along strike. The group includes massive to slightly porphyritic diabase, coarse-grained olivine gabbro, and densely porphyritic dykes (**dp**); the last variety is exemplified by the east-southeast-striking one between Pikalujak kangidlua and Unity Bay,

informally referred to as the 'Nain Hill dyke' (*see* Upton, 1974), an eastwards continuation of which is likely represented by the feldsparphyric dyke on Paul Island north of Two Mile Bay. The marginal zone of coarse east-striking gabbro dykes at the entrance to Tikkoatokak Bay, on the shoreline of Kauk Harbour, and at the entrance to Ten Mile Bay have a spongy and diffuse layering normal to the dyke walls. Most dykes contain olivine and a pleochroic mauve augite; some such dykes are heavily chloritized and have most of the olivine eradicated.

These dykes intrude all other rock units of the map area, but relative ages among the dykes themselves are not firmly established. However, the porphyritic 'Nain Hill dyke' crosscuts a north-striking diabase south of Akpiksai Bay, and a northeast-striking diabase crosscuts a coarse-grained olivine gabbro at the entrance to Ten Mile Bay. M.A. Hamilton derived an emplacement and crystallization age of 1277±1 Ma, based on U–Pb data from baddeleyite, for the large east–west dyke on the south shore entrance to Tikkoatokak Bay.

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